1967

Behavioral Correlates Of Electric Shock Stimulation Of The Rat

John Trevor Hawkins

BEHAVIORAL CORRELATES OF

ELECTRIC SHOCK STIMULATION OF THE RAT

by

John Trevor Hawkins

Department of Psychology

Submitted in partial fulfillment

of the requirements for the degree of

Doctor of Philosophy

Faculty of Graduate Studies

The University of Western Ontario

London, Canada

September 1967

ABSTRACT

The effects of four parameters of electric shock stimulation (constancy of current or of voltage, waveform, intensity, and frequency) on the behavioral responses of rats were studied in a basic 2 x 2 x 3 x 5 design. Each *S* was confined for 5 min in one compartment of a modified Miller shuttle box, and subjected to nine 2-sec grid-floor shocks. The *S* was then immediately confined for 5 min in the second compartment. No shock was administered during this second period. The responses measured during the response acquisition period included the number and relative amplitude of the jumps occurring during the shock presentations, the phase shift of the stimulating waveforms during sine-wave stimulation, and the occurrence and duration of freezing, or immobility, in the nonshock intervals. Eight days, and again 22 days after the response acquisition session, each *S* was placed in the compartment in which shock had previously been administered. The *S* was, during these retention tests, allowed free access to either compartment. No shock was given during the retention tests. The responses measured during these retention tests included the occurrence and duration of freezing, and the number of crossovers from one compartment to the other. The results of this study demonstrated that greater durations of freezing resulted in the response acquisition session, from the interactions of the mode of constancy and intensity. It was suggested that the freezing which occurred following constant voltage stimula-

tion differed qualitatively from that which occurred following constant current stimulation. From the same interaction in the measures of the numbers of jumps and relative amplitudes of jumps, it was concluded that the intensities of the two modes of stimulation equated in decibels were not phenomenologically equal. The re-establishment of a constant current aversion threshold, employing freezing as the significant behavioral referent, was, therefore, recommended. The acquisition of the freezing response under constant current stimulation was examined and a theoretical analysis, consistent with the jump response data of this study, was offered. Three equations, encompassing the four shock parameters investigated, time after stimulation, and number of shock presentations, were formulated to describe in ordinal fashion, the main and interactive effects of the six parameters relevant to jumping, freezing and crossover behavior. It was concluded that freezing was a learned response and that the choice of shock source could, therefore, be made contingent upon the behavioral responses chosen as the dependent behavior in a given experimental situation.

ACKNOWLEDGMENTS

It would seem inevitable that throughout the course of a research project such as this, encouragement, advice and assistance are required. I received each of these in large measure, and I would like to express my appreciation to the people who have helped me.

I am very grateful to my chief advisor, Dr. W. J. McClelland, for his unflagging support, his encouragement and his counsel, and I especially appreciate the fact that he allowed me the unrestricted use of his laboratory facilities. I appreciate, too, the encouragement and advice of the members of my thesis committee: Dr. D. A. Chambers, Dr. H. O. Lobb, Dr. G. J. Mogenson, and Dr. A. U. Paivio.

Dr. R. C. Gardner served as statistical and computer programming consultant. J. Edwin Boyd also assisted, writing three of the data-summary computer programs. Dr. F. R. Wilkinson kindly offered to write the analysis of variance computer programs. Dr. Wilkinson's contribution is doubly appreciated, since, for nearly three months, his efforts were thwarted by a malfunction of the computer Algol compiler program.

Herb M. Simpson helped by taking the photographs of the rats and the test cage. Professor F. Burd also offered his services as photographer and photography tutor. The darkroom facilities of the Psychology Department, Huron College were made available to me through the kindness of Professor Burd. In addition, Professor Burd spent the greater portion of a holiday weekend enlarging and printing the many photographic reproductions of tables and figures appearing in this thesis.

I would like to acknowledge the help of James Sarjeant who designed and constructed the shock amplifier, and of Robert Tape, of Tape's Machine Shop, Ottawa, who did an excellent job of building the two experimental cages from my rather crudely drawn plans. Mr. Tape, as a favor to me, drove to London to deliver the second cage so that the start of this research might not be delayed. I am indebted also to Miss Diane Smallman, who typed the early drafts of this thesis.

I very much appreciated the help of Gordon S. Ivey who served as my able research assistant, helping during the cage habituation and retention test sessions. In addition, he fed and watered the rats, and performed what is perhaps the most onerous duty in a rat laboratory, the cleaning of the cages and excreta pans.

Dr. Larry W. Chamberlain was extremely generous of his time. The proximity of our offices made him a ready target for questions regarding the instrumentation and electro-physiological aspects of this study, and I have benefited from our discussions of these problems.

I owe a special note of appreciation to my wife, Marion, whose encouragement has been unfailing. In the equipment building stage of this research, Marion serving as my assistant, soldered connections, wrapped cables and kept the laboratory records. More recently, Marion has worked arduously, marking the time base on 20,000 feet of Polygraph records and acting as stenographer, typist, proofreader etc. Our two boys, Jeffrey and Craig, have been, by themselves, a special form encouragement to me.

I should also like to acknowledge the support given this thesis by Ontario Mental Health Foundation Grant No. 30 to Dr. W. J. McClelland, and by the Ontario Hospital, London.

TABLE OF CONTENTS

LIST OF FIGURES

FIGURE | | page

FIGURE

page

LIST OF PLATES

LIST OF TABLES

INTRODUCTION

In recent years psychologists have become increasingly concerned with the role of fear in the motivation and acquisition of emotional responses. The concept of fear as a learned anticipatory response (to painful stimulation) having motivating properties was based on the observation that fear responses could be elicited by neutral stimuli conditioned to noxious stimuli, and on the assertion that fear exhibited certain of the major functional properties of primary drives. Specifically, fear is postulated as an energizer or motivator of behavior, and the reduction of fear is, therefore, reinforcing.

This concept of fear as an acquired secondary drive, first expressed by Mowrer (1939), has received considerable empirical support from studies employing noxious stimuli (Campbell & Campbell, 1962; Hawkins, 1964; Hyatt, 1964; Kalish, 1954; McClelland & Colman, 1967; Miller, 1948; Robinson, 1963). Noxious stimuli have been presented in such diverse forms as air puffs (Maier, 1939; Passey, 1948), extremes of temperature (Howard, 1962), loss of support (Lashley, 1938), loud sounds (Donaldson, 1924; Watson & Raynor, 1920), water spray (Maier & Feldman, 1946), white noise (Billingslea, 1942), and wind (Rohles, 1965). The most commonly used noxious stimulus, however, has been electric shock (Solomon & Brush, 1956). This may well have been the result of the ease with which electric shock can be automated, and of the assumption that the use of electric shock permits a more precise stimulus parameter control than is attainable with other noxious stimuli (Hill, Flanary, Kornetsky & Wikler, 1941).

ELECTRIC SHOCK AS STIMULUS

The method of fear conditioning introduced by Miller (1948) has been summarized by Brown and Jacobs (1949):

> The apparatus consisted of an oblong box, divided into two compartments, one white with a grid floor, the other black with a smooth floor. During preliminary training trials, rats were allowed to escape a shock in the white compartment by running into the black, the door being open. On subsequent learning trials, the animals were placed in the white side with the door closed, but with no shock on the grid. If an animal made the 'correct' response of turning a small wheel (located over the door) within 100 sec., the door dropped and the rat could escape into the black compartment. If the response was not made within the allotted time, the animal was lifted out of the box to await its next trial ... (p. 747-8).

While it has been relatively easy to demonstrate avoidance and escape responses by using electric shock stimulation with Miller's technique, the nature and quality of the shock itself has been a major problem confronting the experimental psychologist. Studies of electric shock stimulation have typically involved the measurement and control of the physical parameters, the detection and measurement of behavioral responses, and the definition of the mediating physiological processes.

Helmholtz (1851) observed that it was the rise rather than the decline of a current induced in a secondary coil which was the stimulating component of shock. Helmholtz further observed that the intensity of stimulation experienced was a function of the rate of increase of the current from zero intensity to its maximum intensity. These findings were replicated by Muenzinger and Walz (1932), although it was argued later (Lorge, 1935; Muenzinger & Mize, 1933; Muenzinger & Walz, 1934) that current rather than the waveform risetime was the aspect of electric shock which stimulated and which, therefore, should be controlled. Other experimenters (Forbes & Bernstein, 1935) believed that power[1] was the relevant dimension.

A Committee of the Round Table was formed in 1934 (Forbes, Muenzinger & Wendt, 1935) to consider the problems of electric shock stimulation and to delineate the inadequacies in the various techniques of shock presentation. A major difficulty, according to the committee, was the variability in current density, *i.e.*, the variations in the current per unit of cross sectional area of tissue in contact with the grid bars, which resulted from an animal's movement on the grid floor. The use of a grid as a means of delivering shock was accepted with little criticism even though the variations in the rat's resistance resulting from continued stimulation, and from the different postures assumed by the rat caused successive shocks to be unequal.

As can be seen from a consideration of Ohm's law ($V = IR$, where V = voltage, I = current, and R = resistance), changes in resistance require compensatory changes in voltage, in current, or in power (the product of voltage and current). Owing to random transient variations in resistance resulting from the different postural attitudes of an animal on the grid floor, the shock circuit employed was not a steady state circuit, but was, rather, one in which rapid changes occurred. The shock

[1]Power is the inner product of voltage and current, and can be expressed by the equation: *Actual Power* = $E_{rms} \times I_{rms} \times \mathit{Cosine}\ \phi$, where ϕ is the phase angle.

parameters which varied, and the magnitudes of such variations are determined by the circuit properties. Because the resistance of a *S* changes, *E* is able to hold constant only one of the stimulus parameters, voltage, current, or power.

CONSTANT CURRENT STIMULATION

A constant current circuit[2] introduced by Jenkins, Warner and Warden (1926) achieved a relatively high degree of constancy of current by using a high-voltage source with a large resistance in series with the grid electrodes. It was calculated that with a series resistance of 4 megohms and skin resistance of 100 to 5000 ohms, the maximal change in current would be 0.122 per cent. While more recent evidence has indicated that the skin resistance values chosen for this illustration were low (Campbell & Teghtsoonian, 1958; Muenzinger & Mize, 1933), the method was considered a valuable one, and has been used extensively.

It is apparent that the series resistance method minimized the current fluctuations which resulted from intersubject differences in resistance and from the movements of each *S*. Unfortunately, it exaggerated the changes in current density resulting from variations in the area of grid electrode contact. Although the large series resistor did limit the total current flow in the circuit, the amount of current which stimulated any one point (current density) varied inversely with the area of grid contact. When the area of contact was large, the current density was

[2]A constant current shock source is a regulated power supply which acts to keep its output current constant in spite of changes in load, line, or temperature. Thus, for a change in load resistance, the output current remains constant to a first approximation, while the output voltage changes to accomplish this by whatever amount necessary.

low, and conversely, when the area of contact was small, the current density was high. Thus, while the use of a constant current shock source did provide the psychologist with a relatively high degree of control over the total current flow, it did not control current density. For this reason, in experiments employing active *S*s, a competing immobile response has been observed. This response has been called crouching (Brown & Jacobs, 1949; Miller, 1948), sitting (Bindra & Palfai, 1967), and freezing (Hawkins, 1964; Robinson, 1963).

It was reported by Jackson and Reiss (1934), who worked with human *S*s, that the current level had to be increased by a factor of 4.5 to maintain the same stimulation when the contact areas were increased by amounts comparable to those which would have resulted from changing a grid bar diameter from 1.0 mm to 5.0 mm. The diameters of grid bars used for stimulation of rats have varied from $^1/_{16}$ in. (Fowler, 1963; Hutchinson, Ulrich & Azrin, 1965; Kirby, 1963) to $^5/_8$ in. (Stavely, 1966). Since the threshold of constant current stimulation increases with the area of contact (Forbes & Bernstein, 1935; Jackson & Reiss, 1934; Muenzinger & Mize, 1933), the use of the larger diameter grid bars, which allow greater areas of contact, would require larger currents to maintain equal current densities.

Campbell and Teghtsoonian (1958), in describing the effects of variable current density in the grid situation, reported that:

> ... in the case of the constant current shock source, a high current density is achieved when the animal is making or breaking contact with the electrode. For example, when the animal begins to lift its paw from the grid, the high source voltage (500 v. for both a.c. and d.c. constant-current sources) continues to force the same amount of current through an increasingly smaller skin area which from obser-

> vations of the rat's behavior is apparently more painful. Under conditions of low shock the animals appear to learn to move around less since the amount of shock received while standing still is considerably less than while moving about. This effect disappears, however, when the shock becomes intense enough to stimulate large nerve muscle groups, since the variations in current density probably produce indiscriminable, or minimally discriminable, differences in pain at the high shock levels... (p. 191).

Littman, Stevens and Whittier (1964) further suggested that with constant current stimulation, movement could also result in pinpoint burns on the feet since "... the circuit is such that an arc from *S* to grid bar occurs whenever *S* leaves one or both poles of the grid bar electrodes ..." (p. 98). These pinpoint burns, which are likely due to the high current density at the points of contact and the inability of the tissues to dissipate quickly the heat produced by the arcs, provided lower resistance paths through the foot pads.

ATTEMPTS TO REPLACE THE ELECTRIFIED GRID

Attempts have been made to solve the problems of varying current density by attaching the shock electrodes to the skin. This method was considered adequate for the stimulation of human *S*s (Forbes et al., 1935), but when used with unrestrained animals, the connecting shock leads tended to restrict *S*'s movements. Implantation of the electrodes did ensure the continuation of electrode contact but resulted in a progressive resistance increment as the age of the implant increased (Silver, Schoenfeld, Snapper & Lock, 1964).

Light and Chaffee (1934) eliminated the shock source leads by attaching the terminals of a coil to the rat's skin. Stimulation resulted when the rat passed through an electromagnetic field, the electromagnetic radiation being "picked up" by the secondary coil carried by the rat. A different method was described by Licklider (1951) who proposed a purely capacitance path between the apparatus floor and wall or ceiling. The rat, forming a component of the dielectric between the capacitor plates, was stimulated by the make and break transients of a spark coil and spark gap. Since the intensity of stimulation in each of these methods varied as *S* moved toward or away from the stimulus source, neither was an improvment over the grid floor.

A considerably less complex stimulation method was employed by Campbell and Kraeling (1953) who constructed an alley with two strips of galvanized iron. Each strip formed one side of the alley and one half of the floor. Because the alley was only 2 $^{7}/_{8}$ in. wide, the rat was forced to touch both floor strips and, therefore, could not avoid being stimulated. In addition, the flat continuous grid was thought to provide less opportunity for *S* to decrease the current density by increasing the pressure and surface area of grid contact. While this method was considered by the authors to be superior to the usual grid system, it was not used in later work (Campbell, 1956; Campbell & Campbell, 1962; Campbell & Teghtsoonian, 1958).

A more sophisticated apparatus for shock stimulation, involving telemetry, was discussed by England (1964). His suggestion requires the the rat to carry a radio controlled stimulator. While the recent introduction of microcircuits (Hittinger & Sparks, 1965) coupled with the possibility of sufficient current being derived from animal tissue might facilitate the application of telemetry (Ko & Neuman, 1967), present techniques require the rat to carry relatively large stimulation and power source components.

Despite these many attempts to provide better stimulus control, the administration of electric shock through the grid floor retains such an overwhelming advantage as to simplicity, however deceptive, that it is seldom replaced by the more restrictive or more imaginative procedures.

CONSTANT VOLTAGE STIMULATION

As recorded by Forbes et al. (1935), the use of constant voltage stimulation[3] through the grid floor has generally been rejected as an adequate or controllable method. Although *S*'s movements over the grid bars do not result in changes in current density, continued constant voltage stimulation causes a rapid decrease in the rat's resistance. Campbell and Teghtsoonian (1958), for example, have reported that constant voltage stimulation of 40 volts, 60 Hz[4] sine wave resulted very quickly in increasing excitation and activity which terminated only when the rat became tetanized. They hypothesized that this tetanus was the result of a circular process in which the constant voltage stimulation produced an unspecified emotional response which lowered the rat's resistance, which in turn, was followed by increased current. The emotional reaction so enhanced, furthered the circular process until the current level increased to the point where tetanization occurred.

It has been suggested by a number of investigators that a current of as low as 15 milliamperes is sufficient to cause tetanization (Lorge,

[3]A constant voltage shock source is a regulated power supply which acts to keep its output voltage constant in spite of changes in load, line, or temperature. Thus, for a change in load resistance, the output voltage remains constant to a first approximation, while the output current changes to accomplish this by whatever amount necessary.

[4]Hz is a contraction of *Hertz* and is a contemporary synonym for *cycles per second*.

1935; Spencer, Ingram & Levinthal, 1966). While it is true that the voltage must be greater than zero to maintain a flow of current (except in superconductors cooled below the critical temperature), it need not be large.

Weber (cited by Lorge, 1935) attempted to determine the voltage level at which alternating current became dangerous when each hand grasped a dry shock lead. At 80 volts, 50 Hz, the current flow ranged from 9 to 11 milliamperes. In contrast, only 30 volts were required with damp shock leads to produce a current of 12 to 15 milliamperes. Concerning these current levels, he wrote:

> Fingers, hand, joint of hand, forearm and upper part of arms, as though paralyzed; fingers can hardly be moved; hand can barely be turned; outstretched arm can no longer be bent; bent arm can no longer be straightened; very active pain in fingers, hand, and arms; this condition is bearable only 5-10 seconds (Lorge, 1935, p. 199).

A situation analagous to that reported by Weber occurs when a rat, stimulated by grid shock, defecates or urinates, thereby causing the grid bars and skin to become damp. The skin resistance is thus lowered, and under constant voltage stimulation, the current increases until tetanization results. While the accumulation of body wastes on the grid often results in inter-grid resistances parallel to the rat, the mitigatory effect of reduced current flow through the rat merely retards the onset of tetanization. A further disadvantage of constant voltage stimulation is that a rat, which is making contact with an electrode of one polarity, also makes multiple contact with an electrode of the opposite polarity, or makes contact with more than one electrode of the opposite polarity, and thus provides parallel resistance paths through its body. The abrupt increases in the current due to these parallel resistances are likely to accelerate the onset of tetanization.

Spencer et al. (1966), in their consideration of adequate precautions required for the operation of electrophoresis apparatus, described the dangers of constant voltage when they cautioned:

> It must be remembered that low voltage is not necessarily safer than high voltage. The amperage, or quantity of current flowing is the determining factor in electrical shock. Voltage, resistence [*sic*], quality and area of contact, time and the path through the body are all important factors to be considered. The danger area begins at about 15 milliamperes, which is approximately the "let-go" threshold for most persons. If muscular contractions prevent a person from releasing an energized wire or part, the contact could be fatal. A current flow of 100 to 200 milliamperes is almost always fatal, because this is the range which produces ventricular fibrillation of the heart (p. 1723).

CONSTANT POWER STIMULATION

A number of investigators have suggested that power should be held constant to provide unvarying stimulation. Forbes and Bernstein (1935) reached this conclusion, as did Hill et al. (1952) after their study of the relationship of electrically induced pain, as experienced by human *S*s, to the current and power levels of the shock stimuli. Campbell and Teghtsoonian (1958) after their extensive investigation of the electrical effects of shock stimuli on the rat, also concluded that power was the stimulating parameter, and advocated the development of a constant power[5] stimulator.

England (1964) presented a design for a constant power shock source and electronic grid scrambler. Since the shock source was essentially the

---

[5]A constant power shock source is a power supply which acts to keep its output power constant in spite of changes in load, line, or temperature. Thus, for a change in load resistance, the output power remains constant to a first approximation, while the output voltage and current change to accomplish this by whatever amounts necessary.

same as the matched impedance sources employed by Campbell (1956), Miller and Murray (1952), and Sheffield and Temmer (1950), its primary advantage appeared to be its integration with a noiseless grid scrambler or commutator. Campbell and Teghtsoonian (1958) suggested that the matched impedance source, with its resistance in series with the output, approximates a constant power source over a restricted range of load resistance. In an expanded report of their research, they indicated that at low shock intensities, the impedance[6] of the shock source (150K ohms) tends to match the impedance of a rat. However, the power dissipated within the rat remains constant (within 10 per cent) only so long as the rat's resistance is more than 80K ohms, but less than 275K ohms. At high intensities, the rat's resistance is greatly lowered, and, therefore, the load impedance (impedance of the rat) no longer matches the impedance of the shock source. As a result, a greater proportion of the power is dissipated in the rat than is dissipated in the series resistor, and with respect to the rat, the power no longer remains constant.

Campbell and Teghtsoonian (1958), in discussing the requirements of a satisfactory shock, presumed that it would be one which produced with each increment in shock intensity, a proportional increase in the animal's activity. From the results of their investigation, they concluded that the matched impedance shock source incorporating a 150K ohm resistor in series with the output, while providing constant power stimulation over only a restricted range of load resistance, did satisfy this

[6]Impedance, a term used to denote the relationship between applied voltage and the resulting current in an ac circuit, is analagous to resistance in a dc circuit, but in addition, incorporates phase shift which is not relevant to the dc circuit.

behavioral criterion.

Recent reports by Colman (1966), and McClelland and Colman (1967) have questioned the necessity of making a distinction between matched impedance and constant current shock sources. These investigators found that the amount of freezing, *i.e.*, immobility as contrasted to movement, elicited by the matched impedance source was not significantly different from that elicited by the constant current source. An examination of Colman's report, and his schematic representation of the ac shock source, and a review of the same material from the expanded report of Campbell and Teghtsoonian, show that the matched impedance and constant current sources differ, not in a qualitative manner, but only with respect to the intensity of the input voltage and the value of the output series resistor. The repeated occurrences of freezing in response to matched impedance stimulation (Brookshire et al., 1961; Campbell & Teghtsoonian, 1958; Colman, 1966; Hawkins, 1964; Hyatt, 1964; Miller, 1948) argue strongly for the inclusion of the matched impedance version of the constant power shock source in the constant current classification as was proposed by McClelland and Colman (1967).

BEHAVIORAL CRITERIA

The behavioral criterion for a *good shock* applied by Campbell and Teghtsoonian (1958) represented a change in emphasis from the control of the physical parameters of the stimulus to control of the behavioral responses elicited by the stimulation. Although such a position was taken much earlier by Forbes et al. (1935) who recommended that standardization should be "... in terms of a standard amplitude of response rather than in terms of a standard amount of current ..." (p. 193), and by Kellogg

(1941) who stated that "... a constant performance by the subject means a constant intensity of stimulation from the *subject's point of view* ..." (p. 87), few attempts at the definition and quantification of such behavior have been made. The recent introduction of more sensitive activity measurement techniques (Bolles, 1966; Hoffman & Fleshler, 1964; McClelland, 1965) should encourage an increased recognition of the behavior control concept.

The quantification of fear resulting from electric shock stimulation has been dependent primarily upon measurements of activity and spatial preferences (Brookshire et al., 1961; Campbell & Campbell, 1962; Hyatt, 1964). More specifically, the measurements recorded in the typical shuttle box situation have been the number of crossovers from one compartment to the other, and the amount of time spent on the *safe* or nonshock side. These measures were based on the assumption that fear would manifest itself in perambulatory behavior. It is not always a movement response, however, which is acquired in a learned fear situation. Rather, as pointed out by Miller (1959):

> ... Whether an animal shows increased activity by jumping or decreased activity by crouching to an electric shock depends on whether the reward of turning off the shock is administered for jumping or crouching. It will be remembered that my definition of drive says nothing about activity, but deals rather with increasing the performance of responses *rewarded* by the offset of the drive or by the goal objects that produce its satiation (p. 255).

Since it has been argued that the immobility results in a reduction of the experienced intensity of constant current stimulation, crouching may well be learned when physical escape from the shock compartment is difficult (Robinson, 1963), or impossible (Bindra & Anchel, 1963; Brogden, Lipman & Culler, 1938; Brookshire et al., 1961; Denenberg, 1964; Feirstein

& Miller, 1963; Gwinn, 1951; Hawkins, 1964; Hyatt, 1964; Littman et al., 1964). Although this behavior might be considered as being passive, Bindra and Palfai (1967) pointed out that the promptness with which freezing can be transformed into active behavior suggests that motor readiness is high during freezing. Indeed, Bindra and Palfai argue that the freezing response would be enhanced by an increase in motor readiness.

THE FREEZING RESPONSE

The term *freezing* appears to have been introduced by Curti (1935, 1942) who, after observing rats in the presence of cats, argued that a rat exhibited a fear response if it remained immobile or frozen on the same base for three or more minutes. Later definitions applied this term to the immobile behavior which accompanied electric shock stimulation, but these definitions often assumed the presence of a specific physiological state in the rat, *e.g.*, rigidity, Robinson (1963), tonic immobility, Brookshire et al. (1961), and tension, Brogden et al. (1938). Since these states were seldom measurable, they were not recorded. The tendency to rely on activity measures, and to ignore freezing thus appears to have arisen from the difficulty in defining objectively those responses involving lack of movement.

Robinson (1963) defined freezing as "... an elongated position in which *S* supports itself rigidly on four paws or on its hind legs. The *S* typically stares ahead and remains immobile or sways slightly" (p. 816). This definition is quite complex, and involves many factors, some of which are mutually exclusive. Not defined are the minimum time *S* must remain immobile, and the quantity and quality of movement tolerated in the freezing response. Hyatt's (1964) definition, while less complex than Robinson's, allowed only one occurrence of the response since freezing extended "... from the introduction of the *S* to the 'fear' side of the apparatus until the position of one or more paws had changed" (p. 14). Hawkins (1964) made a distinction between freezing with four feet on the grid and freezing with only the hind feet on the grid, but the definition required, essentially, the nonmovement of the feet for a minimum period of five seconds. McClelland (1966) rephrased this simplified definition in electromechanical terms for use with the capacitance sensing motion detector (McClelland, 1965). Because similar sensing and recording instruments were used in the present research, McClelland's definition of freezing was employed. Specifically, freezing was defined as:

> ... the lack of movement of the feet and other body parts in contact with the grid-floor of the experimental cage for a minimum of five seconds, as evidenced by a lack of recorder pen deflection at a rate not exceeding 2% of full scale for the 5-second period (p. 3).

Notwithstanding the earlier conception that freezing was an innate response to electrical stimulation (Munn, 1950), its concordance with constant current stimulation argues against such an interpretation, and the interpretation of freezing as a learned response has received experimental support from Gwinn (1951), and Hawkins (1964). Gwinn, employing 100 volts, has shown that rats given 16 shocks displayed greater and more prolonged freezing than did those given 4 shocks. Hawkins' data support Gwinn's observation and provided evidence that freezing incremented over trials.

The occurrence of a competing freezing response during training trials has proven troublesome for a number of investigators. For example, Feirstein and Miller (1963), to prevent the occurrence of freezing, implanted shock leads in the backs of rats. The leads were extended under the skin to electrodes embedded in the hind legs. Robinson (1963) modified her training procedure to eliminate freezing. Some *S*s were given additional training sessions, while others were subjected to a shaping procedure in an effort to replace the freezing response with a wheel turning response.

Hyatt (1964) found that freezing during fear retention testing confounded the interpretation of the traditional time measurements of spatial preference. While she recorded as freezing only the initial occurences of immobility, the reoccurrence of the immobile behavior, being incompatible with the crossover responses which determine spatial preference, caused her to question the reliability of the spatial preference measures.

It would, therefore, seem necessary to re-examine the behavioral responses specific to the basic parameters of electric stimulation. Thus the present investigation considered the effects on behavior of four primary dimensions of electric shock in a modified shuttle box, grid floor situation.

THE VARIABLES INVESTIGATED

Inasmuch as the resistance of *S* varies, *E* can hold constant either voltage or current, and as is evident from the foregoing review, the resulting behavioral responses would appear to be dependent upon which of these two factors is held constant. Accordingly, the behavioral effects of constant current stimulation and constant voltage stimulation were studied.

As pointed out by Campbell and Teghtsoonian (1958), Colman (1966), and McClelland and Colman (1967), the amount of activity during the shock planted shock leads in the backs of rats. The leads were extended under the skin to electrodes embedded in the hind legs. Robinson (1963) modified her training procedure to eliminate freezing. Some *S*s were given additional training sessions, while others were subjected to a shaping procedure in an effort to replace the freezing response with a wheel turning response.

Hyatt (1964) found that freezing during fear retention testing confounded the interpretation of the traditional time measurements of spatial preference. While she recorded as freezing only the initial occurences of immobility, the reoccurrence of the immobile behavior, being incompatible with the crossover responses which determine spatial preference, caused her to question the reliability of the spatial preference measures.

It would, therefore, seem necessary to re-examine the behavioral responses specific to the basic parameters of electric stimulation. Thus the present investigation considered the effects on behavior of four primary dimensions of electric shock in a modified shuttle box, grid floor situation.

THE VARIABLES INVESTIGATED

Inasmuch as the resistance of *S* varies, *E* can hold constant either voltage or current, and as is evident from the foregoing review, the resulting behavioral responses would appear to be dependent upon which of these two factors is held constant. Accordingly, the behavioral effects of constant current stimulation and constant voltage stimulation were studied.

As pointed out by Campbell and Teghtsoonian (1958), Colman (1966), and McClelland and Colman (1967), the amount of activity during the shock period and the later testing period is influenced by the intensity of stimulation. Although it has not been possible to equate directly those stimulus intensities expressed in volts with those expressed in milliamperes, it should be noted that phenomenological equivalence can be obtained by the method of paired comparisons. Campbell (1967), and Campbell and Teghtsoonian (1958) defined the aversion threshold of a shock as that intensity which the animal avoided 75 per cent of the time in a spatial preference situation. It was assumed that the aversion threshold intensities for the various types of shock were phenomenologically equivalent, that is, formed a common behavioral reference point. Campbell and Teghtsoonian, using the decibel scale suggested by Forbes et al. (1935) as a common logarithmic scale for the various types of shock, referred to the aversion threshold as the "zero" or "reference" decibel level. The values which they report, and which were later confirmed by Colman (1966) were 10 root mean square (rms)[7] volts for constant voltage ac shock, and .063 rms milliampere for constant current ac shock. The specifying of stimulus intensities in rms units, although a common practice, is not convenient when nonsinusoidal wave forms are employed. Since both sine-wave and square-wave stimulation were used in the present investigation, the reference decibel levels were expressed as 18 peak[8] volts for constant voltage, and .089 peak milliampere for constant current. The decibel, being a unit based on the ratio between two electrical powers, allowed the equating of

[7]The root mean square (rms) voltage is the square root of the average of the square of the instantaneous voltages, integrated over one cycle.

[8]The peak voltage is a measure of the maximum voltage amplitude, and is 1.414 times the rms voltage.

stimulus intensities above and below these avoidance thresholds or zero decibel levels. Such equated intensities were determined by the Campbell and Teghtsoonian (1958) formula:

$$N_{db} = 20 \log_{10} \frac{SI_x}{SI_o}$$

where SI_x is the avoidance threshold stimulus intensity, and SI_o is the stimulus intensity at the desired decibel level.

The third factor investigated was that of waveform. Although in physiological research both sine- and square-wave stimulation have been employed, a search of the literature did not reveal any investigation of behavioral correlates of stimulation using different waveforms. Therefore, as mentioned previously, behavioral responses to both sine-wave and square-wave stimulation were assessed. While it is true that the waveform intensities were equal when expressed in peak values, they were not equal when expressed in rms values. If peak intensity forms the stimulating component of waveform, one would expect no significant differences in the behavioral responses elicited by the two forms of stimulation. Should such differences occur, further investigation beyond the scope of this study would be required to assess the relevance of the rms intensity and of the rise time of the waveform to the experienced intensity of shock.

The last dimension of shock considered in this study was that of frequency. While varying the frequency of alternation does appear to have some effect, the results of previous studies are difficult to interpret. For example, Gilmer (1937) found that the amount of current necessary to cause pain in humans increased as the frequency of the stimulating current increased. Plutchik and Hirsch (1963) found that the impedance and phase angle[9] of human skin decreased as the frequency of the stimulating current was increased from 1 Hz to 1000 Hz. Similar results were reported by Campbell and Teghtsoonian (1958) who found rats' resistances higher under direct current stimulation (essentially a low frequency rectangular wave stimulation because of the grid polarity reversals arising from the use of a grid scrambler) than under 60 Hz sine-wave stimulation, and by England (1964) who investigated impedance over the frequency range of dc to more than 6000 Hz. Despite the growing body of information regarding the physiological concomitants of stimulation at various frequencies (Barnett, 1938; Grings, 1953), little is yet known of the behavioral changes which might result from the attenuation or intensification of the experienced stimulus accompanying stimulation at different frequencies.

On the basis that "there has not been a single study that unequivocally evaluates the relative qualities of any of the different kinds of shock" (Cornsweet, 1963, p. 119), this research was proposed as a means of recording and measuring the different behaviors elicited by electric shock stimulation varying in the mode of constancy (constant current and constant voltage), waveform (sine wave and square wave), intensity (5, 10, and 15 db) and frequency of alternation (60, 120, 240, 480, 960 Hz). The use of a modification of Miller's (1948) fear conditioning paradigm allowed the acquisition of activity and spatial preference measures comparable to those obtained in earlier studies (Campbell, 1956; Campbell & Campbell, 1962; Campbell & Teghtsoonian, 1958; Colman, 1966; Hawkins, 1964; Hyatt, 1964; McClelland, 1966).

[9]Phase is the fraction of a cycle that an ac signal is at any instant away from some reference point on the waveform. The difference in phase of two signals, *e.g.*, current and voltage waveforms, is measured in degrees or fractions of a complete angular rotation, and is called the phase angle.

As is evident from the preceding review, it might have been possible to present hypotheses concerning the behavior due to the main effects of shock stimulation. However, since the reliability of much of the early work is in question, and since a paucity of relevant information precluded the formulation of hypotheses regarding behavior due to interactive effects, the present research was executed as an explorative investigation of the behavioral correlates of four basic parameters of electric shock stimulation in a modified Miller shuttle box situation.

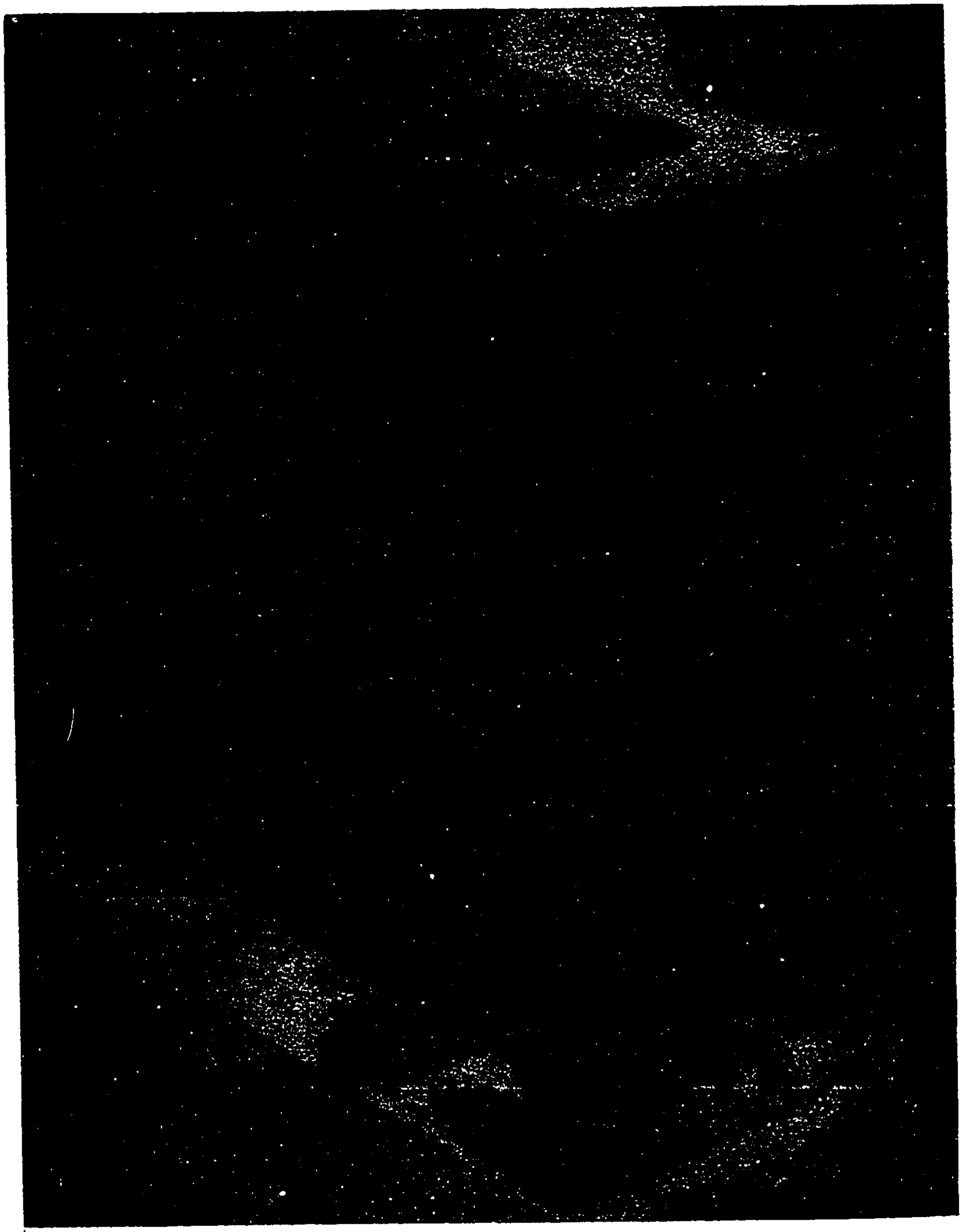


PLATE 1. One of the two modified Miller shuttle boxes used in this study. Shown at the bottom of the black compartment are the hydraulic suspension system and the ballistic movement transducer.

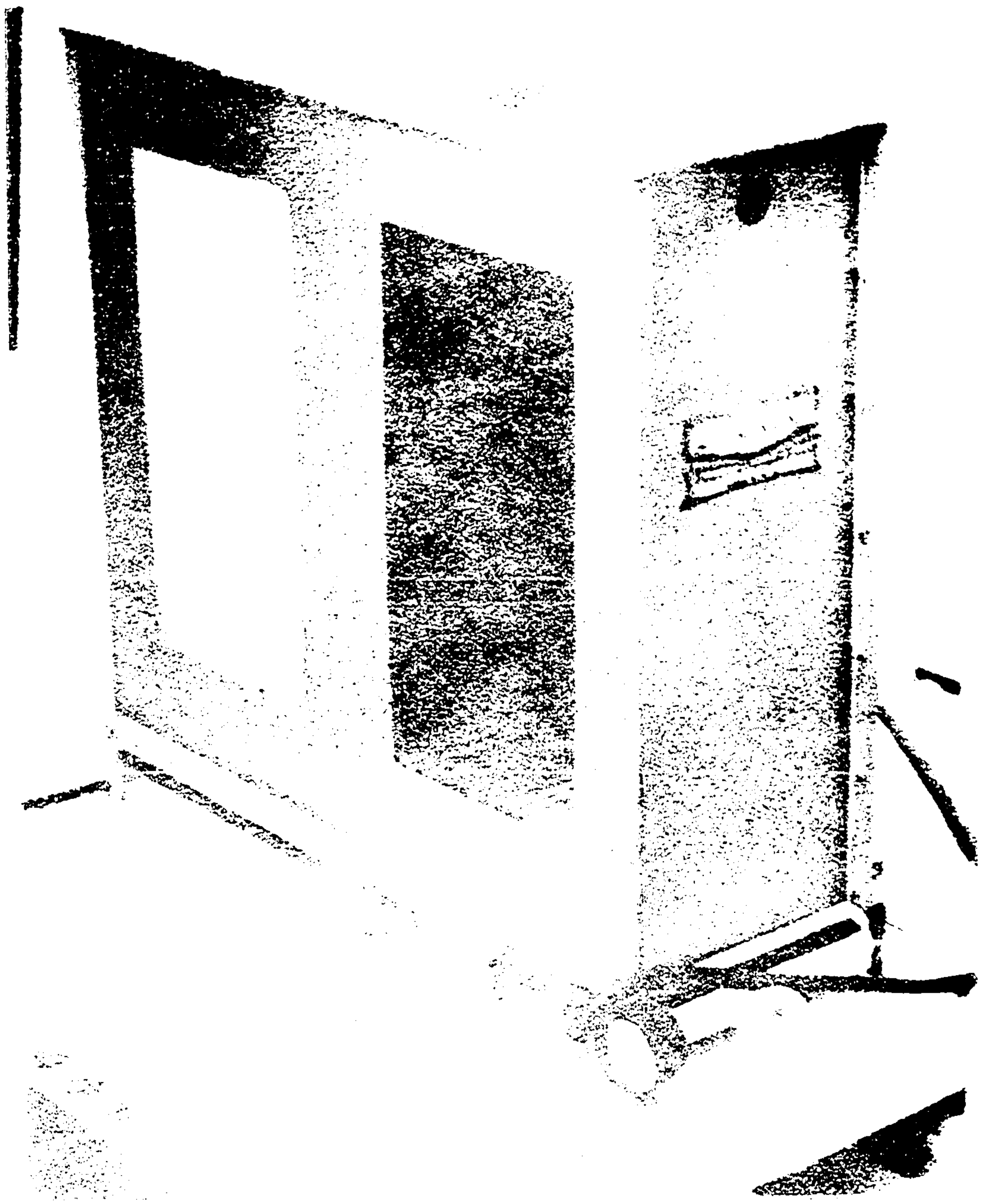


PLATE 1. One of the six modified Miller shuttle boxes used in this study. Shown at the bottom of the black compartment are the hydraulic suspension system and the ballistic movement transducer.

METHOD

SUBJECTS

*S*s were 366[10] adult male Sprague-Dawley albino rats secured from the Collip Medical Research Laboratory colony, The University of Western Ontario. All *S*s were allowed food and water *ad libitum*, and were housed two to a cage in an environment-controlled colony room.

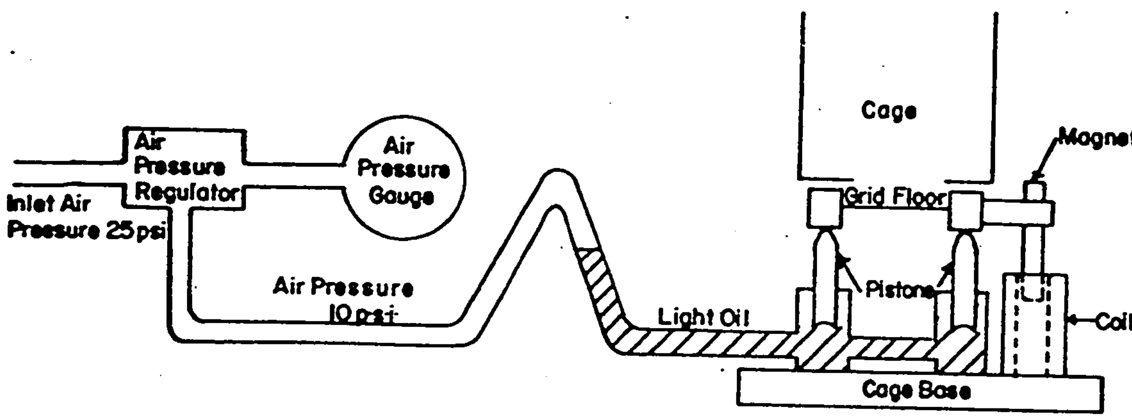
DESIGN

Six rats were assigned to an apparatus-check group and to each of the 60 experimental groups of the basic 2 x 2 x 3 x 5 factorial design. The *S*s of each experimental group were stimulated by one of the 60 shock parameter combinations (*e.g.*, under one mode of constancy at one intensity level, using one waveform at one frequency of alternation), with each group being administered a different shock parameter combination. The *S*s of the apparatus-check group were not shocked.

APPARATUS

Cage habituation, response acquisition, and retention testing were conducted in modified Miller shuttle boxes (Plate 1) incorporating a hydraulic suspension system designed for recording the ballistic-type move-

[10]Because of a malfunction in the recording apparatus, the freezing scores of four rats during response acquisition were not available. Four additional rats were employed in order that the number of *S*s in each group was equal. During the course of the study, 36 rats died: 10 of these deaths were attributed to natural causes; 25 were probably related to the effects of shock; and one rat was destroyed because it developed a paralysis of the forelimbs. All of these *S*s were replaced.



Jump Detection System

(Not to Scale)

FIGURE 1. Schematic representation of the hydraulic suspension system and the ballistic movement transducer.

ment characterizing the jump response (Brown, Kalish & Farber, 1951; Hoffman & Fleschler, 1964). Each cage was 20 in. high, 7 in. wide, and 20 in. long. A removable partition was used to divide each cage into two compartments, each 10 in. long. Double-walled construction, with outer walls of steel, and inner walls of clear plexiglass, allowed the insertion of colored cards. In this manner, the shock compartment of each cage was made black, and the nonshock compartment white.

The floor of each cage consisted of 41 stainless steel rods $^1/_8$ in. diameter, mounted at $^1/_2$ in. intervals in a plexiglass frame. The grid floor under the black compartment (the compartment in which *S*s were shocked) was separate from the cage walls and was supported on pistons under a pressure of 10 psi. Firmly fixed to the side of this floor was a cylindrical permanent magnet which, when the rat jumped, moved through a stationary coil mounted on the base of the cage (Plate 1 and Figure 1). Such a movement of the magnet through the coil produced a current proportional to the rate at which the magnetic lines of force crossed the coil. The transducer was, in this manner, highly sensitive to the sudden, sharp movements involved in jumping, but was relatively insensitive to the slower, though perhaps gross, movements involved in general activity. The output of the coil was amplified by a Grass 5P1 preamplifier and Grass 5 driver-amplifier, and was recorded on one channel of a Grass 5D Polygraph recorder.

A jump was recorded during response acquisition whenever the Grass recording pen showed a downward deflection of 10 mm or more during each 2-sec shock presentation. This operational definition was based on a pilot study in which it was observed that at the amplifier gain setting used, random nonjumping activity seldom caused a recorder pen deflection of 10 mm, while jumping activity resulted in pen deflections greater than 10 mm. Responses made during the nonshock intervals, while recorded, were not included in the data of this study.

The activity of *S*s in the periods between shocks during response acquisition, and during retention testing was monitored by a capacitance sensing motion detector (McClelland, 1965) incorporating the grid floor and cage walls. The output of the motion detector was amplified by a Grass 5P1 preamplifier, and was recorded on the Grass 5D Polygraph. Immobility, and thus freezing, as defined earlier (p. 15), was recorded as a relatively constant and unvarying pen deflection. A total freezing score, in seconds, was obtained for each *S* by summing the duration of each freezing response.

During the response acquisition session, the solid partition prevented *Ss* from crossing between compartments. This partition was replaced during retention testing by one having a floor level opening 3 $^1/_2$ in. wide and 4 in high, thus, allowing *S* access to both compartments. *S*'s presence in either of the two compartments was detected by contact sensing devices (Drinkometers) utilizing vacuum tube actuated relays (Hawkins & McClelland 1967). Two such devices were used for each cage (Appendix A). A crossover was recorded only when the rat broke contact with the sensing circuit in the one compartment and completed the circuit in the compartment it was entering. Since the pattern of grid wiring created a neutral zone approximately 1 $^1/_2$ in. long on either side of the partition, it was necessary that somewhat more than half the body length of the rat be in the second compartment before a crossover was recorded. This dual criterion prevented jumping activity and incomplete cage entries from being counted as crossovers.

To minimize extraneous auditory and visual stimuli, the experimental cages were placed in ventilated isolation chambers with fluorescent lighting. Random sounds were further masked in each isolation chamber by a 75-db sound generated by a Foringer 1291 masking noise generator, and presented by a 5-in. speaker mounted in the centre of the rear wall of the isolation chamber.

Shock stimulation was provided by a Heath IG-82 sine-square wave generator, the output of which was amplified by the constant current/constant voltage amplifier designed and constructed for this study (Appendix B). A Foringer 1155 grid shock scrambler was used to eliminate the possibility of *S*s learning to avoid shock by standing on alternate grids. Shock presentations were controlled by a Gerbrands strip-film interval programmer and solid-state timer.

CAGE HABITUATION

Each *S* was placed in the apparatus with access to either compartment, for a 5-min period on each of the two days preceding the day of the response acquisition session.

RESPONSE ACQUISITION

To eliminate the possibility of differences in the efficiency of apparently identical shock sources (Bolles, 1966), and motion transducers, only one experimental cage was used during response acquisition. Although previous studies (Campbell & Campbell, 1962; Hyatt, 1964) found that the side of the apparatus in which *S*s were shocked had no apparent effect on behavior, all *S*s in this investigation were shocked in the black compartment[11]. Each *S* was placed individually in the black compartment with the solid partition between the two compartments. Nine shocks, each of 2-sec duration, were presented from the same variable interval schedule over a period of five minutes.

Shock frequency settings were made with the aid of an Eico 460 oscilloscope. The vertical attenuator control was set at the calibrator position resulting in a sine wave at power line frequency (60 Hz) being fed to the vertical amplifier. The sweep vernier was adjusted until the 60 Hz power line frequency was displayed as two complete and synchronized cycles on the oscilloscope screen. The vertical attenuator was then set at the required input voltage setting and the frequency of the Heath IG-82 sine-square wave generator was adjusted until the required input frequency of 60, 120, 240, 480, or 960 Hz was synchronized with the critical sweep frequency of the oscilloscope. This procedure was followed each time the frequency was reset.

Intensity levels in the constant current mode were set using a frequency of 60 Hz with a 200k ohm resistor across the shock amplifier output. There was no noticeable change in the amplitude of the current trace on the oscilloscope[12] when the frequency was reset. Sine-wave current

[11]The black compartment was chosen because it was found in a pilot study that *S*s showed a preference for the darker compartment. The results of two recently published studies (Allison, Larson & Jensen, 1967; Douglas, 1966) support this finding. Any experimental bias introduced by the choice of the black compartment as the shock compartment should, therefore, tend to increase the rigor of the tests of learned fear behavior.

[12]The current waveforms were obtained by measuring the voltage drop over a resistor in series with the output of the shock amplifier. A 100Ω resistor was used at the constant voltage setting, and a 1KΩ resistor was used at the constant current setting.

levels were set using a Simpson 0 - 1 milliameter. The sine-wave input to the shock amplifier was increased until the meter indicated a peak current of .15, .28, or .49 milliampere (.11, .20, or .35 milliampere rms - the 5, 10, and 15 db levels). The 200K ohm resistor was removed from the circuit after each current level setting.

A Telequipment D43 oscilloscope was used to secure the equivalent peak square current. A 60 Hz sine-wave current of .11 milliampere rms, as indicated by the Simpson 1359 milliameter, was displayed on the oscilloscope screen. The vertical gain control was adjusted until the amplitude of the current trace measured 2 cm. The sine-wave input to the shock amplifier was then replaced by a square-wave input. This current was adjusted until the amplitude of the trace on the oscilloscope measured 2 cm. The reading indicated by the Simpson 1359 milliameter at this setting was recorded. This procedure was repeated to secure the square-wave peak current of .28 or .49 millampere. Subsequent square-wave current settings were made using the Simpson 1359 milliameter. The 200K ohm resistor was removed from the circuit after each setting of a square-wave current level.

Intensity levels in the constant voltage mode were set with an open output circuit at a frequency of 60 Hz using a Simpson 635 voltmeter. The shock amplifier sine-wave input voltage was adjusted until the meter indicated the 5 db, 10 db, or 15 db levels of 32, 57, or 101 peak volts (23, 40, or 71 volts rms). There was no noticeable change in the amplitude of the voltage trace on the oscilloscope when the frequency was reset.

Equivalent peak square-wave voltages were secured with the aid of the Telequipment D43 oscilloscope in the same manner as was used in securing square-wave current levels. A note was made of the voltage levels indicated by the meter when the peak square-wave voltages equalled the peak sine-wave voltages. On subsequent occasions, the square-wave voltage levels were set with the aid of the Simpson 635 meter.

Immediately following the presentation of the shocks in the black compartment, *S* was placed in the white compartment for five min. At the end of this time, *S* was returned to its living cage. Before the next *S* was placed in the experimental cage, the grid bars were cleaned with a dry nylon scouring pad to prevent build up of excreta which might have affected the intensity of shock and the sensitivity of the recording devices.

As a periodic check on the operation of the stimulation and movement sensing devices, animals of the apparatus-check group spent five min in the black compartment and five in the white but received no shock stimulation.

The data recorded during response acquisition included the occurrence of each freezing response in the black compartment, and in the white compartment, and the time (in seconds) at which each such response met the 5-sec duration requirement, and the time (in seconds) at which each such response terminated; and the occurrence and relative intensity of each jump during the shock presentations.

Computer programs were written (Appendix A) which summarized these data and provided the following primary behavioral response measures:[13]

(1) the mean number of jumps during each shock presentation;

(2) the mean relative amplitude of jumps during each shock pre-

[13]A number of other behavioral response measures were also computed from the response acquisition data. A list of all response acquisition measures is presented in Appendix C.

sentation;

(3) the mean duration of freezing in the black compartment;

(4) the mean duration of freezing in the white compartment; and

(5) the mean duration of freezing in the black and white compartments combined.

To assist in the interpretation of the data, phase angle measurements were made of each sine-wave shock. To secure these phase angle measurements, two still photographs of the voltage and current waveforms of each sine-wave shock as displayed on the screen of the Telequipment D43 oscilloscope were made using a Bolex 16 mm movie camera. The camera was programmed to take the photographs approximately ¼ sec and 1¼ sec after the onset of each shock. The first, ninth, and eighteenth photographs[14] for each *S* were displayed on the screen of a Craig 16 mm movie editor. The waveform length and waveform displacement, as displayed on the editor screen, were measured in millimetres. A Fortran IV program was written for an IBM 7040 computer which calculated the phase angles using the following formula:

$$\text{Phase Angle} = \frac{\text{Waveform Displacement}}{\text{Waveform Length}} \times 360°$$

<u>RETENTION TESTING</u>

Retention testing, without shock, occurred 8 days, and again 22 days after the response acquisition session. After each retention inter-

[14]In those instances where measurements could not be made (*i.e.*, when *S* was off the grids, thus causing the current waveform to collapse), the other photograph taken during that shock presentation (*i.e.*, the second, tenth, or seventeenth photograph) was used.

val, each *S* was placed in the black compartment of the experimental cage, separated from the white compartment by the partition with the floor level opening. Each *S* was tested individually for a period of 20 min.

The data recorded during retention testing included the occurrence of each freezing response in the black compartment and in the white compartment, and the time (in seconds) at which each such response met the 5-sec duration requirement, and the time (in seconds) at which each such response terminated; and the number of crossovers from one compartment to the other.

Computer programs were used to summarize these data and to provide the following primary behavioral response measures:[15]

(1) the mean duration of freezing in the black compartment;

(2) the mean duration of freezing in the white compartment;

(3) the mean duration of freezing in the black and white compartments combined;

(4) the ratio of time spent freezing in the black compartment to the total time spent in the black compartment;

(5) the ratio of time spent freezing in the white compartment to the total time spent in the white compartment; and

(6) the total number of crossovers.

[15]As was the case with the response acquisition data, a number of other behavioral response measures were also computed from the retention test data. These measures are also listed in Appendix C.

RESULTS

An analysis of variance was performed on each of the primary measures computed from the response acquisition and retention test data.[16] Of these measures, only those which concerned the jumping responses and phase shifts were recorded during the 2-sec shock stimulation periods. Each of these showed a significant effect due to differences in the frequency of the stimulating current. No such effect was found, however, in any of the analyses of the nonshock interval measures of response acquisition, or in any of the measures of the retention tests. Therefore, the data of these measures were reanalyzed, collapsing over the frequency dimension, and consideration of these measures is limited to the analyses in which the data were collapsed over frequency.

The results are presented in discrete sections concerning the responses measured during the response acquisition and the two retention test sessions. A final section reports the details of the inter-retention tests analyses. Relevant tables and figures are presented at the end of each section.

---

[16]An analysis of variance was performed on each of the measures of response acquisition and retention tests. Summaries of the levels of significance achieved by the main effects and interactions of all analyses appear in Appendix D. Summaries of the means, and of the analyses of variance appear in Appendices E to L. It is anticipated that the remaining measures will receive further statistical and interpretative attention at a later date.

RESPONSE ACQUISITION ANALYSES

Nonshock Interval Measures

The freezing response data were analyzed using a 2 x 2 x 3 analysis of variance with the stimulus conditions: mode of constancy, waveform, and intensity as variables. This analysis, summarized in Table 1, indicated that for the mean total-freezing in the response acquisition periods, the difference attributable to waveform was significant (F = 23.008, df = 1/348, p<.0005). Sine-wave stimulation produced a mean of 352.5 seconds freezing and square-wave a mean of 393.9 seconds freezing. There was also a significant intensity effect (F = 5.596, df = 2/348, p≤.005) with the mean duration of freezing increasing from 356.0 seconds at 5 db, to 372.3 seconds at 10 db, and to 391.3 seconds at the 15 db intensity.

Because the total-freezing measure was composed of two subscores, freezing in the black compartment and freezing in the white, a 2 x 2 x 3 analysis of variance was applied to each of these subscores. The summaries of these analyses appear in Tables 2 and 3. The analysis of freezing in the black compartment revealed only one significant main effect, that of waveform (F = 20.038, df = 1/348, p<.0005). As with the mean total-freezing response, there was a greater mean duration of freezing (155.9 seconds) in the black compartment due to square-wave stimulation than to sine-wave stimulation (136.7 seconds). The analysis of freezing in the white compartment also indicated a significant main effect of the constancy parameter (F = 4.578, df = 1/348, p<.05).

There was a significant constancy x waveform interaction for total-freezing (F = 8.656, df = 1/348, p<.005), for freezing in the black compartment ($F = 4.228$, $df = 2/348$, $p<.05$), and for freezing in the white compartment ($F = 7.439$, $df = 1/348$, $p<.01$). As shown by the graphic representations in Figures 2, 3 and 4, constant current sine-wave stimulation in each case resulted in a greater mean duration of freezing than did constant voltage sine-wave stimulation. Under square-wave stimulation, however, holding the voltage constant resulted in greater mean durations of freezing than did holding the current constant.

The only significant constancy x intensity interaction during response acquisition occurred in the analysis of freezing in the white compartment ($F = 6.486$, $df = 2/348$, $p<.005$). As shown in Figure 5, at the lowest intensity the greater mean duration of freezing was elicited by constant current stimulation. With increasing intensity, the mean freezing resulting from constant current decreased while that resulting from constant voltage stimulation increased.

The analysis of total freezing showed a significant waveform x intensity interaction ($F = 4.215$, $df = 2/348$, $p<.025$) with square-wave stimulation producing more mean freezing at all intensities than sine-wave stimulation. Whereas, under square-wave stimulation, the greatest mean duration of freezing occurred at the 10 db intensity, the sine-wave function shows a monotonic increase from the lowest to the highest intensity.

The analysis of freezing in the black compartment presents essentially the same interactive pattern ($F = 3.085$, $df = 2/348$, $p<.05$) as the analysis of total-freezing, but the interactive pattern of freezing in the white compartment ($F = 3.720$, $df = 2/348$, $p<.05$) differs in that the mean duration of freezing following sine-wave stimulation increased with increasing intensity in an apparently more linear fashion, and the mean duration of freezing under square-wave stimulation did not reach a maximum at the 10 db intensity level as it did in the total-freezing measure. These interactions are plotted in Figures 6, 7 and 8.

A constancy x waveform x intensity interaction was revealed in the analysis of total freezing (F = 5.743, df = 2/348, p<.005) and in the analysis of freezing in the black compartment (F = 7.812, df = 2/348 p<.0005). These functions, as shown in Figures 9 and 10, show some similarities. In each case, there was a greater mean duration of freezing elicited at the lowest intensity under constant voltage square-wave stimulation. These differences, however, became progressively less as the intensity increased. In the case of total-freezing, the constant voltage sine-wave function and the constant current square-wave function appear to be nearly linear.

Shock-Interval Measures

For the jump measures, a 2 x 2 x 3 x 5 x 9 repeated measures analysis of variance was used, with mode of constancy, waveform, intensity, frequency, and shock presentation (the repeated measure) as variables. These analyses are summarized in Tables 4 and 5.

A significant constancy effect was indicated by the analysis of the mean relative amplitude of jumps (F = 55.898, df = 1/300, p<.0005), and of the analysis of the mean number of jumps (F = 52.449, df = 1/300, p<.0005). Both the mean number of jumps and the mean relative amplitude of jumps were greater under constant current conditions (a mean of 10.8 jumps of 3.2 mean relative amplitude) than under constant voltage (a mean of 7.1 jumps of 2.5 mean relative amplitude). There was also a significantly greater mean number of jumps (F = 4.841, df = 1/300, p<.05) under square-wave stimulation (mean of 9.5) than under sine-wave stimulation (mean of 8.4 jumps).

Intensity had a significant effect on the mean relative amplitude of jumps (F = 20.428, df = 2/300, p<.0005), there being an increase from a mean of 6.7 jumps of 2.4 mean relative amplitude at 5 db, to 9.9 of 3.0 mean relative amplitude at 10 db, and to 10.1 of 3.1 mean relative amplitude at the 15 db intensity.

A significant main effect of frequency was shown by both the analysis of the mean relative amplitude of jumps (F = 6.989, df = 4/300, p<.01, Figure 11), and the analysis of the mean number of jumps (F = 8.461, df = 4/300, p<.0005, Figure 12) with the mean relative amplitude of jumps and the mean number of jumps increasing as the frequency of the stimulating current was increased.

The analysis of the mean relative amplitudes of jumps indicated a significant constancy x intensity interaction (F = 22.667, df = 2/300, p<.0005). As shown in Figure 13, the greatest mean relative amplitude under constant current stimulation occurred at 10 db. Under constant voltage stimulation, the greatest mean relative amplitude occurred at the 15 db intensity level, with the increase in amplitude appearing to be a nearly-linear function of the intensity expressed in decibels. Essentially the same interactive pattern as was revealed by the analysis of the mean number of jumps (F = 26.012, df = 2/300, p<.0005) is portrayed in Figure 14.

A significant waveform x intensity interaction was indicated by only the mean relative amplitude of jumps analysis (F = 4.786, df =

2/300, p<.01). This interactive function, as shown in Figure 15, indicates a higher mean relative amplitude of jumping under square-wave stimulation.

There was a significant intensity x frequency interaction for the mean relative amplitude of jumps (F = 2.916, df = 8/300, p<.005). As shown by Figure 16, at the lowest intensity the mean relative amplitude increased, although nonmonotonically, with increasing frequency. At the 15 db intensity, the mean relative amplitude was lowest at a frequency of 120 Hz. It then increased as the frequency increased. Both analyses of variance showed a significant main effect of time or number of shock presentations. With both the mean relative amplitude of jumps measure (F = 8.797, df = 8/2400, p<.005), portrayed in Figure 17, and the mean number of jumps measure (F = 21.809, df = 8/2400, p<.0005), portrayed in Figure 18, there was an increase in amplitude and in number of jumps from the first to the second shock presentation, and a decrease after the fourth shock presentation.

The analysis of the mean number of jumps showed a significant constancy x time interaction (F = 7.017, df = 8/2400, p<.0005). As illustrated in Figure 19, a greater mean number of jumps resulted from constant current at all shock presentations. While the mean number of jumps under constant current stimulation reached a maximum at the second presentation and then declined, under constant voltage stimulation the mean number of jumps continued to increase over trial three before declining after the fourth shock presentation.

There was a significant intensity x time interaction for the mean relative amplitude of jumps (F = 8.797, df = 16/2400, p<.0005) and for the mean number of jumps (F = 12.518, df = 16/2400, p<.0005). The functions, as plotted in Figures 20 and 21, are somewhat similar, particularly with respect to the 15 db intensity functions. The mean relative amplitude of jumps was highest under 15 db stimulation until after the fifth shock presentation when the 10 db intensity produced the highest mean relative amplitude of jumps. The mean number of jumps functions show a similar reversal after the fourth shock presentation.

There was also for each of these measures, a significant constancy x intensity x time interaction. In both the mean relative amplitude of jumps (F = 1.860, df = 16/2400, p<.025) and the mean number of jumps (F = 4.619, df = 16/2400, p<.0005) measures, illustrated in Figures 22 and 23, the constant voltage 5 db function appears to be well separated from, and representative of lesser scores than the other functions.

The phase shift data were analyzed by a 2 x 3 x 5 x 3 repeated measures analysis of variance with the variables being mode of constancy, intensity, frequency and frame (*i.e.*, the time dimension). The three frame levels constituted the repeated measure. Since only sine-wave data were analyzed, waveform did not constitute a variable. Table 6 is a summary of this analysis.

Constancy had a significant effect on phase shift (F = 8.219, df = 1/150, p<.005). The 36.0 degree mean phase shift which resulted from the constant current sine-wave stimulation was significantly less than the 42.8 degree mean phase shift under constant voltage sine-wave stimulation. There was also a significant effect due to intensity under sine-wave stimulation (F = 32.889, df = 2/150, p<.0005) with the mean phase shift decreasing from 49.4 degrees at the 5 db intensity, to 42.3

degrees at the 10 db intensity, and to 26.5 degrees at the 15 db intensity level.

The main effect of frequency under sine-wave stimulation was significant ($F = 43.041$, $df = 4/150$, $p < .0005$) with the mean phase shifts increasing with frequency. For the frequencies of 60, 120, 240, 480 and 960 Hz the mean phase shifts in degrees were 21.6, 26.1, 35.4, 48.7 and 64.1 respectively. The repeated measure main effect of frame was also significant ($F = 10.292$, $df = 2/300$, $p < .0005$) with the mean phase shift decreasing from 46.5 degrees during the first shock presentation to 35.9 degrees during the middle and the last shock presentation.

The significant constancy x intensity interaction ($F = 4.550$, $df = 2/150$, $p < .025$) is illustrated in Figure 24. While the mean phase shift decreased as the intensity increased, the mean phase shift under constant voltage sine wave stimulation was, at the lower two intensities, greater than under constant current stimulation.

There were three other significant interactions, constancy x intensity x frequency ($F = 3.394$, $df = 8/150$, $p < .001$); constancy x frequency x frame ($F = 2.305$, $df = 8/300$, $p < .025$); and constancy x intensity x frame ($F = 2.431$, $df = 4/300$, $p < .05$) which reflected the main effects of frequency and intensity. Since the patterns of individual functions, however, are inconsistent, they do not appear to assist the interpretation of the primary behavioral responses.

QUALITATIVE OBSERVATIONS

During the response acquisition sessions, it was observed that some *S*s exhibited a particular behavior in which *S* fell on its side with its fore-legs drawn up and its hind-legs extended as shown in Plate 2.

PLATE 2. A rat which has fallen to its side following electric shock stimulation.

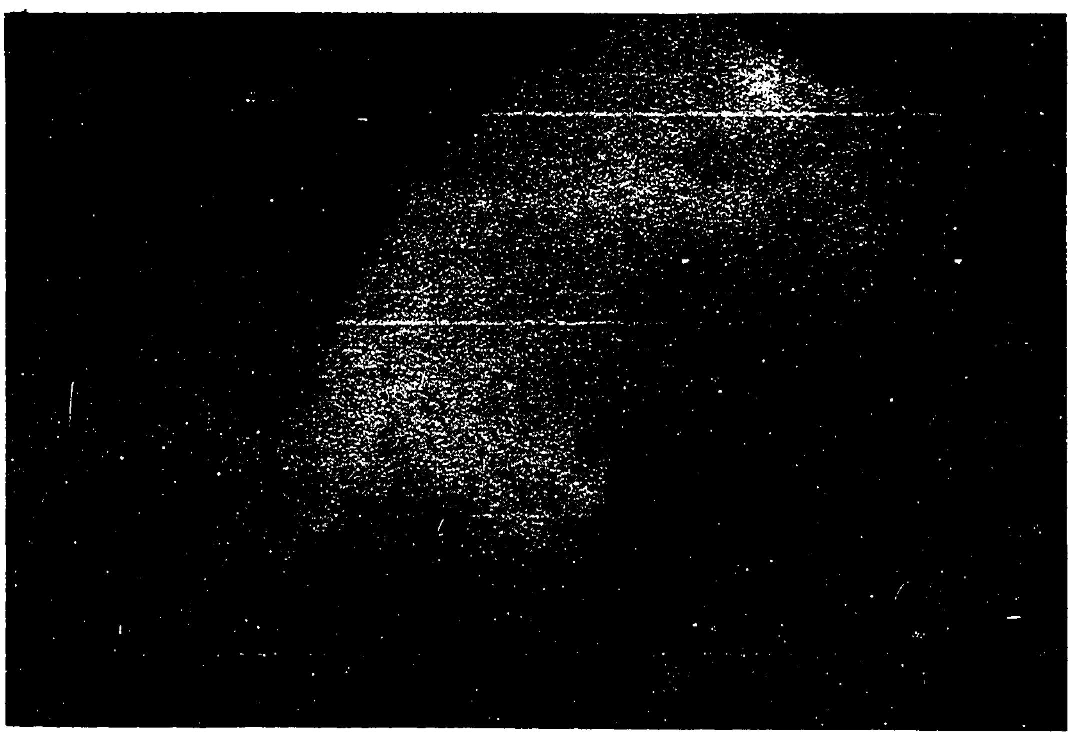


PLATE 3. A rat in an upright position during electric shock stimulation.

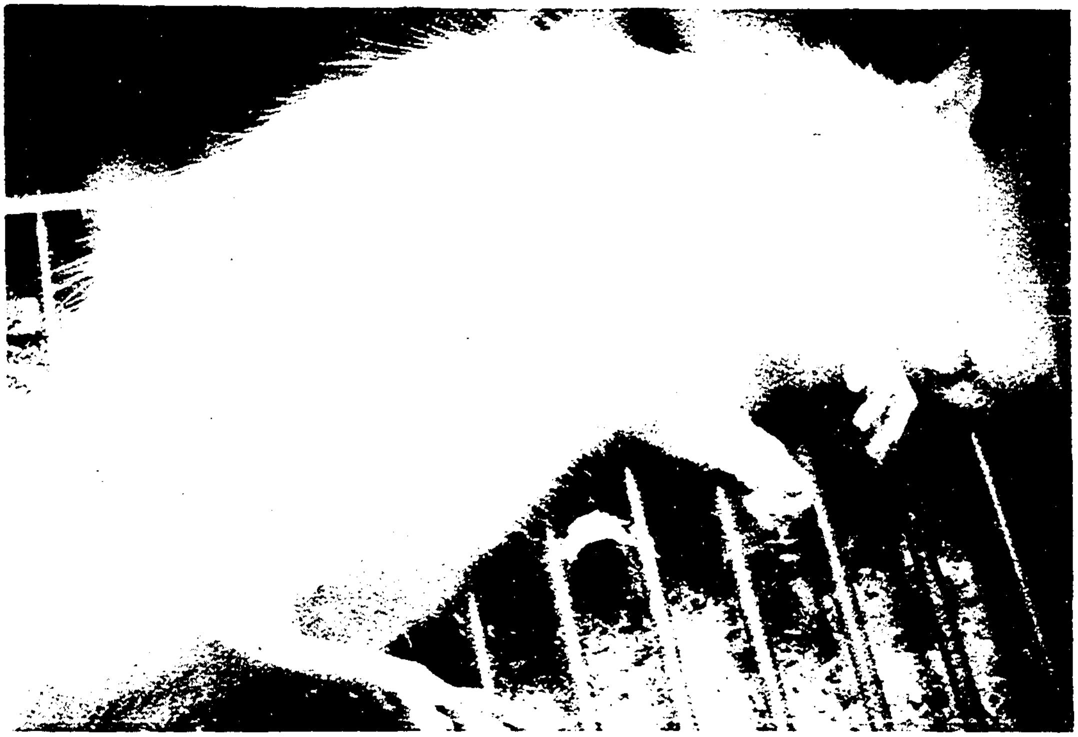


PLATE 2. A rat which has fallen to its side following electric shock stimulation.

PLATE 3. A rat in an upright position during electric shock stimulation.

This behavior occurred initially during the actual shock presentation, but often persisted after the termination of the shock. (In some cases, *S* maintained this behavior throughout the 5-min period spent without shock in the white compartment.) In many other instances, S supported itself during the shock presentation, with the limbs extended, the back humped, and the head lowered, as illustrated in Plate 3.

Although this behavior was observed as early as the first shock presentation, it more often occurred first during a later shock, and while it was not always coincident with the shock onset, it seldom terminated before the offset of the shock, when *S* appeared to relax and fall to the grid. After displaying this behavior, the rats sometimes walked about the shock compartment, and some did not repeat the immobile behavior on subsequent shock presentations. This behavior was generally accompanied by an irregular movement of the hind-legs, or conversely, an apparent paralysis of limbs, irregular respiration, irregular heart rate, bleeding from the nose or mouth, discoloration of the feet, piloerection, ejaculation, urination, and defecation. In a number of instances, the jaws were locked on a grid bar. In one case, this condition existed for more than 15 min after the last shock presentation. In some cases, *S*s died during the response acquisition session or shortly after.

There were 48 recorded observations of this behavior, with 38 occurring under constant current stimulation. Of these, 37 occurred at the 10 db and 15 db intensities. Similarly, all recorded occurrences under constant voltage conditions resulted from stimulation at the 10 db or 15 db intensity level. Stimulation at 120 Hz and 240 Hz resulted in 20 of the occurrences under constant current conditions, and 9 of the occurrences under constant voltage stimulation.

Of the 25 deaths attributed to the effects of electric shock, more than half occurred at 120 Hz and 240 Hz as shown in Figure 25, and seven exhibited the behavior described above. It is of interest to note also that 72 per cent of the deaths occurred under constant current stimulation.

During retention testing, differences were noticed in the freezing behavior displayed by *S*s of the constant current and constant voltage groups. Those which had experienced constant current stimulation, when freezing, remained motionless on the grid, with only an occasional turning of the head. The rats which had experienced constant voltage shock also remained immobile on the grid when freezing, but the immobility was characterized by more numerous and more rapid movements of the head and body (excluding the feet) than were evident in constant current freezing. These behavioral differences were reflected in the Polygraph recordings; the records of constant current freezing showed fewer and smaller oscillations. The amplitudes of the oscillations in constant voltage freezing, however, were not greater than those allowed by the definition of freezing.

TABLE 1

Summary of Analysis of Variance of Total-Freezing during Response Acquisition as a Function of Constancy, Waveform, and Intensity

SOURCE	MS	DF	F
CONST (A)	11690.000	1	1.743
WV-FRM (B)	154304.500	1	23.008 [6]
INTEN (C)	37530.750	2	5.596 [3]
A x B	58048.000	1	8.656 [3]
A x C	17900.000	2	2.669
B x C	28267.000	2	4.215 [1]
A x B x C	38517.750	2	5.743 [4]
ERROR	6706.471	348	

[1] $p<.05$

[3] $p<.01$

[4] $p<.005$

[6] $p<.0005$

TABLE 2

Summary of Analysis of Variance of Freezing in the Black Compartment during Response Acquisition as a Function of Constancy, Waveform, and Intensity

SOURCE	MS	DF	F
CONST (A)	173.875	1	0.105
WV-FRM (B)	33291.125	1	20.038[6]
INTEN (C)	4981.969	2	2.999
A x B	7024.063	1	4.228[1]
A x C	213.344	2	0.128
B x C	5124.938	2	3.085[1]
A x B x C	12979.250	2	7.812[6]
ERROR	1661.362	348	

[1] $p<.05$

[6] $p<.0005$

TABLE 3

Summary of Analysis of Variance of Freezing in the White Compartment during Response Acquisition as a Function of Constancy, Waveform, and Intensity

SOURCE	MS	DF	F
CONST (A)	14550.000	1	4.384[1]
WV-FRM (B)	44250.250	1	13.334[6]
INTEN (C)	15192.125	2	4.578[1]
A x B	24687.750	1	7.439[3]
A x C	21524.875	2	6.486[1]
B x C	12345.875	2	3.720[1]
A x B x C	6883.625	2	2.074
ERROR	3318.550	348	

[1] $p<.05$

[3] $p<.01$

[6] $p<.0005$

TABLE 4

Summary of Analysis of Variance of Jump Amplitudes per Shock Presentation during Response Acquisition as a Function of Constancy, Waveform, Intensity, and Frequency

SOURCE	MS	DF	F
CONST (A)	37849.844	1	55.898[6]
WV-FRM (B)	1565.281	1	2.312
INTEN (C)	13832.500	2	20.428[6]
FREQ (D)	4732.594	4	6.989[3]
A x B	30.813	1	0.046
A x C	15347.953	2	22.667[6]
A x D	446.078	4	0.659
B x C	3240.953	2	4.786[3]
B x D	822.695	4	1.215
C x D	1974.336	8	2.196[4]
A x B x C	1233.375	2	1.822
A x B x D	1024.797	4	1.513
A x C x D	618.949	8	0.914
B x C x D	917.277	8	1.355
A x B x C x D	193.121	8	0.285
ERROR	677.120	300	

(cont.)

Table 4 (cont.)

SOURCE	MS	DF	F
TIME (E)	204.168	8	2.929[4]
A x E	132.664	8	1.903
B x E	59.066	8	0.847
C x E	613.219	16	8.797[6]
D x E	72.015	32	1.033
A x B x E	123.020	8	1.765
A x C x E	129.641	16	1.860[2]
A x D x E	75.145	32	1.078
B x C x E	67.180	16	0.964
B x D x E	87.500	32	1.255
C x D x E	80.702	64	1.158
A x B x C x E	70.480	16	1.011
A x B x D x E	51.090	32	0.733
A x C x D x E	71.457	64	1.025
B x C x D x E	62.116	64	0.891
A x B x C x D x E	52.954	64	0.760
ERROR	69.706	2400	

[2] $p < .025$

[3] $p < .01$

[4] $p < .005$

[6] $p < .0005$

TABLE 5

Summary of Analysis of Variance of Number of Jumps per Shock Presentation during Response Acquisition as a Function of Constancy, Waveform, Intensity, and Frequency

SOURCE	MS	DF	F
CONST (A)	11308.271	1	52.449[6]
WV-FRM (B)	1043.803	1	4.841[1]
INTEN (C)	3805.226	2	17.649[6]
FREQ (D)	1824.258	4	8.461[6]
A x B	1.830	1	0.008
A x C	5608.251	2	26.012[6]
A x D	211.200	4	0.980
B x C	317.009	2	1.470
B x D	179.604	4	0.833
C x D	364.024	8	1.688
A x B x C	205.335	2	0.952
A x B x D	172.577	4	0.800
A x C x D	353.733	8	1.641
B x C x D	204.636	8	0.949
A x B x C x D	164.412	8	0.763
ERROR	215.605	300	

(cont.)

Table 5 (cont.)

SOURCE	MS	DF	F
TIME (E)	272.190	8	21.089 [6]
A x E	87.575	8	7.017 [6]
B x E	21.674	8	1.737
C x E	156.230	16	12.518 [6]
D x E	13.915	32	1.115
A x B x E	20.453	8	1.639
A x C x E	57.643	16	4.619 [6]
A x D x E	15.493	32	1.241
B x C x E	16.886	16	1.353
B x D x E	16.354	32	1.310
C x D x E	10.778	64	0.864
A x B x C x E	7.321	16	0.587
A x B x D x E	14.713	32	1.179
A x C x D x E	17.924	64	1.436
B x C x D x E	14.899	64	1.194
A x B x C x D x E	10.938	64	0.876
ERROR	12.481	2400	

[3] $p < .01$

[4] $p < .005$

[6] $p < .0005$

TABLE 6

Summary of Analysis of Variance of Sine-Wave Phase Shifts during Response Acquisition as a Function of Constancy, Intensity, and Frequency

SOURCE	MS	DF	F
CONST (A)	6162.0313	1	8.219[4]
INTEN (C)	24659.3711	2	32.889[6]
FREQ (D)	32270.7480	4	43.041[6]
A x C	3411.3828	2	4.550
A x D	413.9492	4	0.552
C x D	1017.4434	8	1.357[2]
A x C x D	2544.9512	8	3.394[5]
ERROR	749.7732	150	
TIME (E)	673.9258	2	10.292[6]
A x E	832.0586	2	1.272
C x E	665.0645	4	1.017
D x E	1002.5596	8	1.533
A x C x E	1590.0078	4	2.431
A x D x E	1507.0918	8	2.305
C x D x E	575.2114	16	0.880
A x C x D x E	335.2871	16	0.513
ERROR	653.9669	300	

[2] $p < .025$

[4] $p < .005$

[5] $p < .001$

[6] $p < .0005$

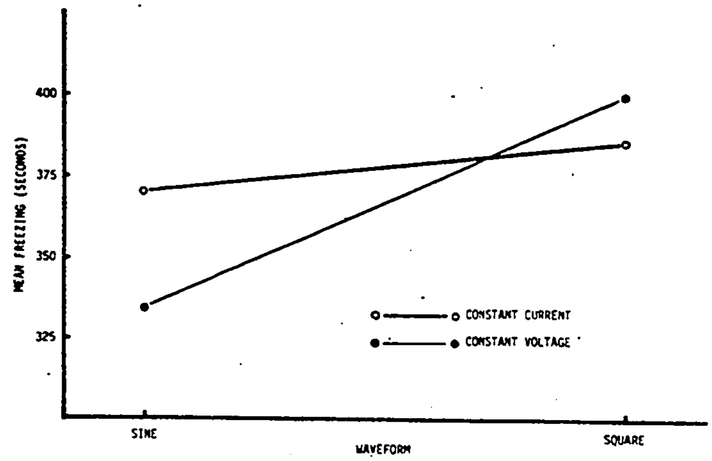


FIGURE 2. The mean total-freezing as a function of constancy and waveform (collapsed over frequency) during response acquisition.

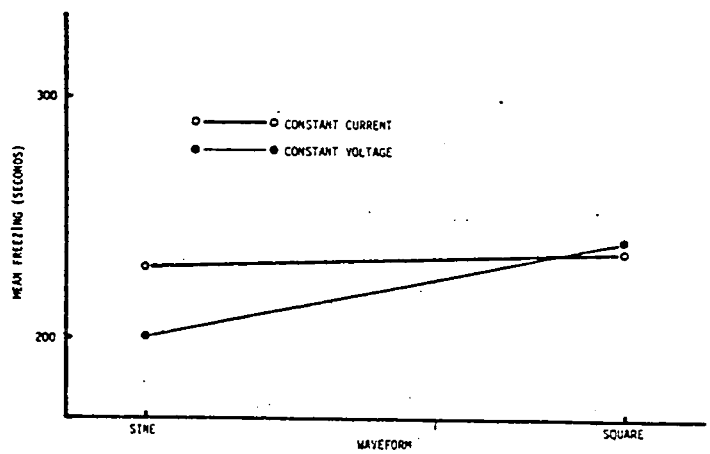


FIGURE 3. Mean freezing in white compartment as a function of constancy and waveform (collapsed over frequency) during response acquisition.

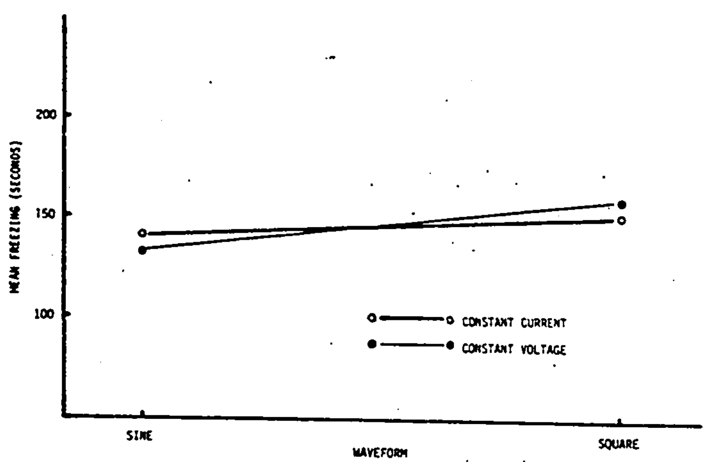


FIGURE 4. Mean freezing in black compartment as a function of constancy and waveform (collapsed over frequency) during response acquisition.

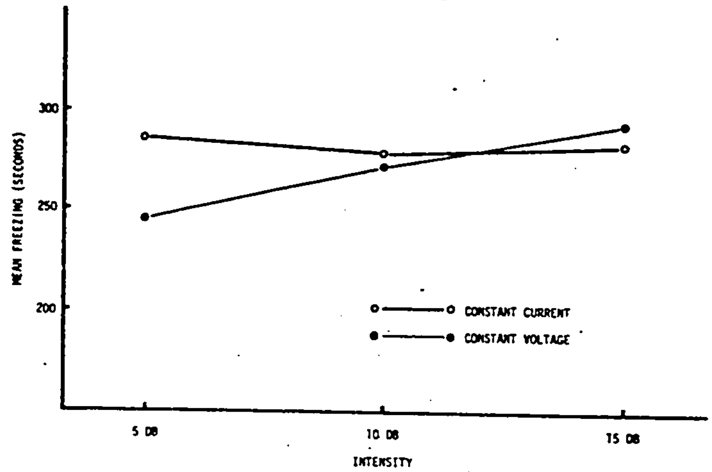


FIGURE 5. Mean freezing in white compartment as a function of constancy and intensity (collapsed over frequency) during response acquisition.

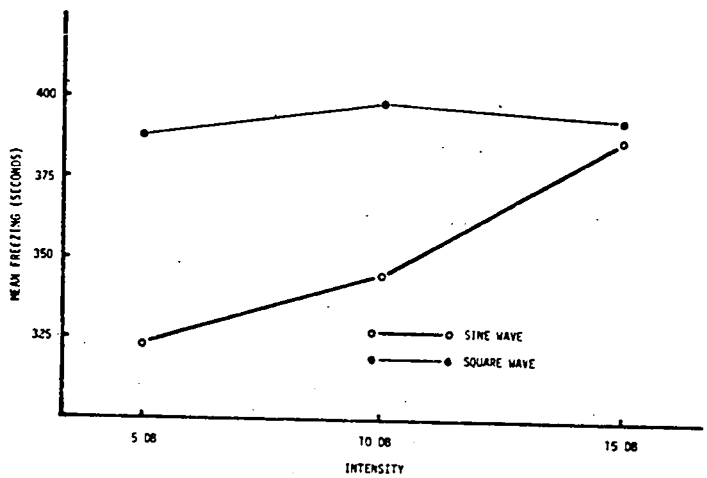


FIGURE 6. Mean total-freezing as a function of waveform and intensity (collapsed over frequency) during response acquisition.

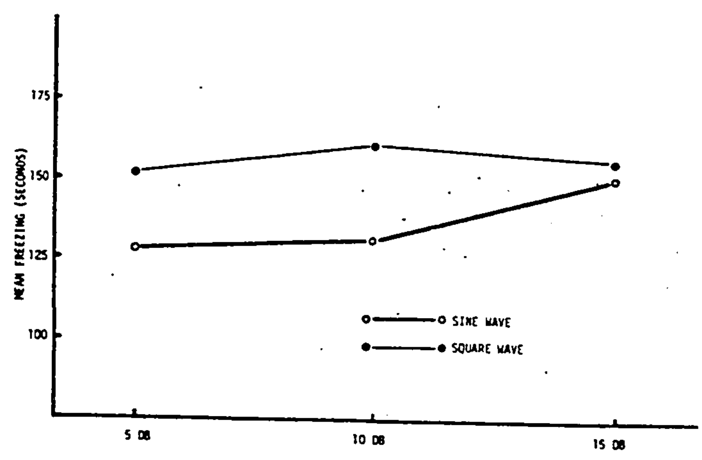


FIGURE 7. Mean freezing in black compartment as a function of waveform and intensity (collapsed over frequency) during response acquisition.

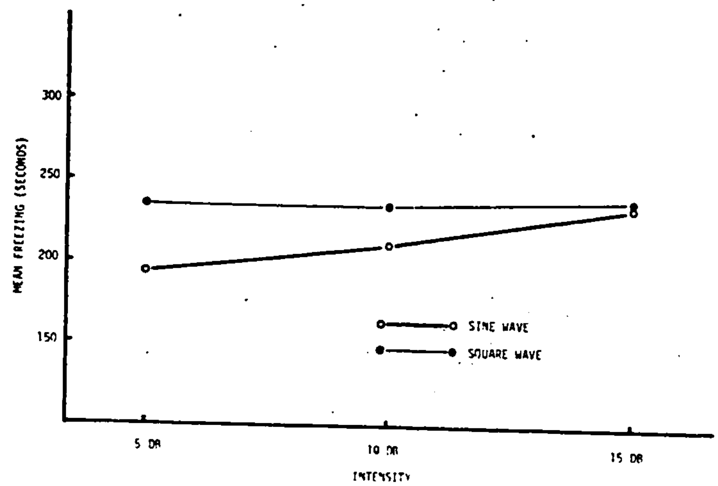


FIGURE 8. Mean freezing in the white compartment as a function of waveform and intensity (collapsed over frequency) during response acquisition.

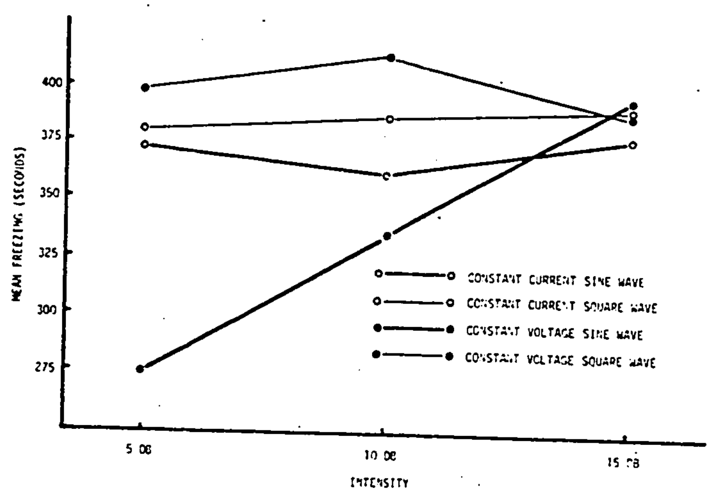


FIGURE 9. Mean total-freezing as a function of constancy, waveform and intensity (collapsed over frequency) during response acquisition.

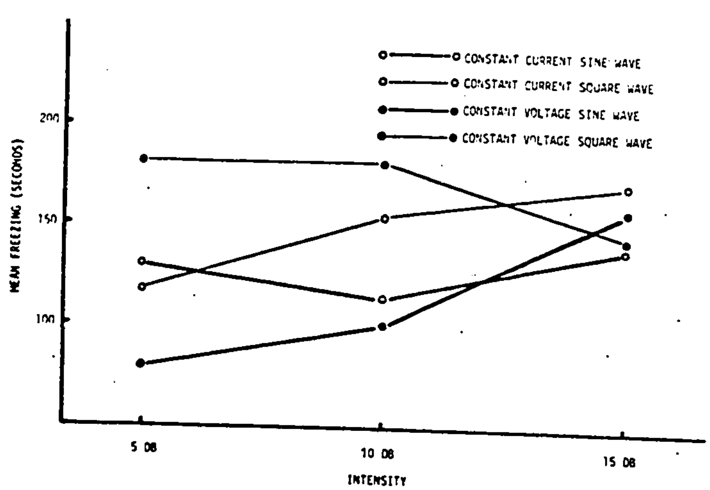


FIGURE 10. Mean freezing in the black compartment as a function of constancy, waveform and intensity (collapsed over frequency) during response acquisition.

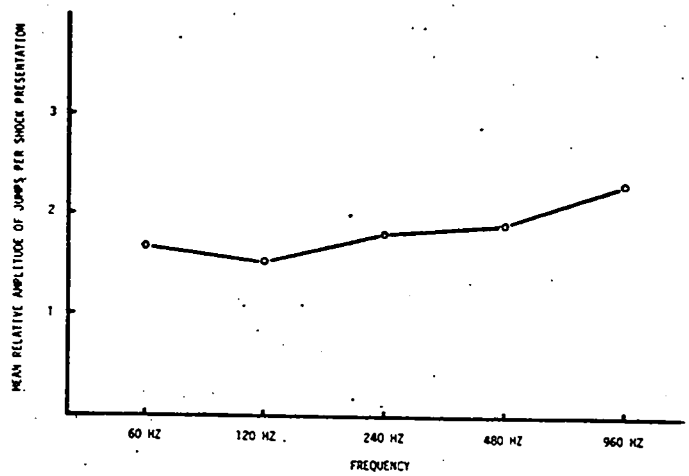


FIGURE 11. Mean relative amplitude of jumps per shock presentation as a function of frequency.

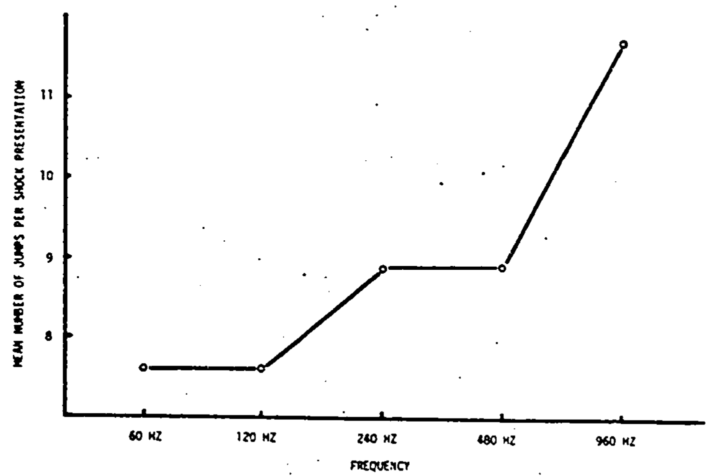


FIGURE 12. Mean number of jumps per shock presentation as a function of frequency.

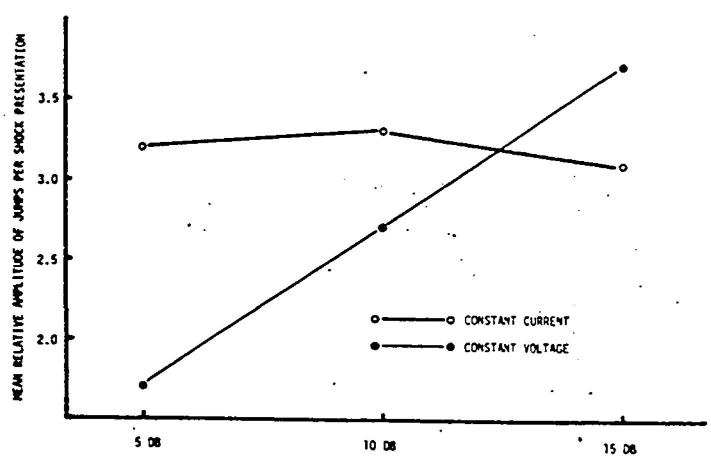


FIGURE 13. Mean relative amplitude of jumps per shock presentation as a function of constancy and intensity.

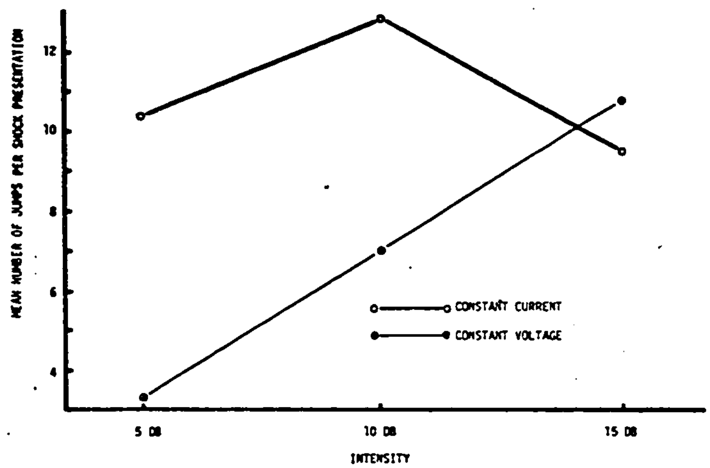


FIGURE 14. Mean relative amplitude of jumps per shock presentation as a function of constancy and intensity.

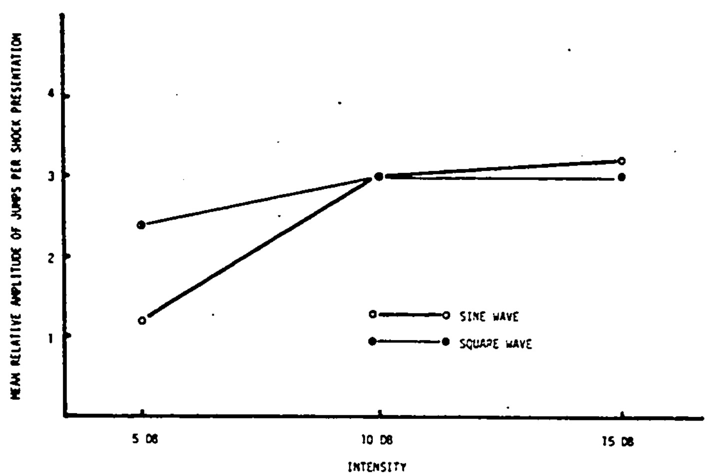


FIGURE 15. Mean relative amplitude of jumps per shock presentation as a function of waveform and intensity.

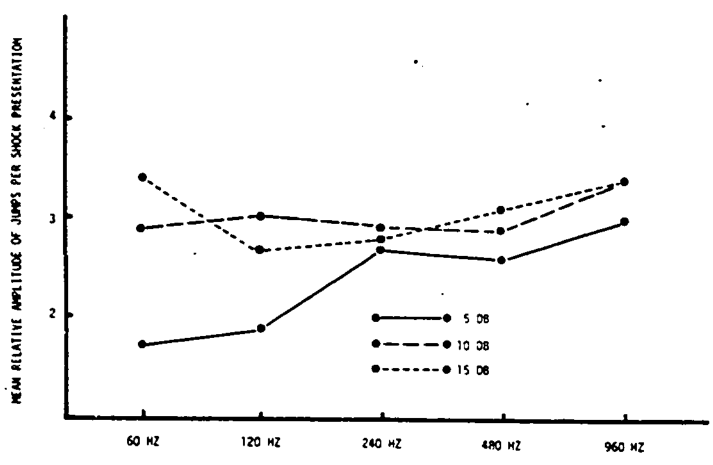


FIGURE 16. Mean relative amplitude of jumps per shock presentation as a function of intensity and frequency.

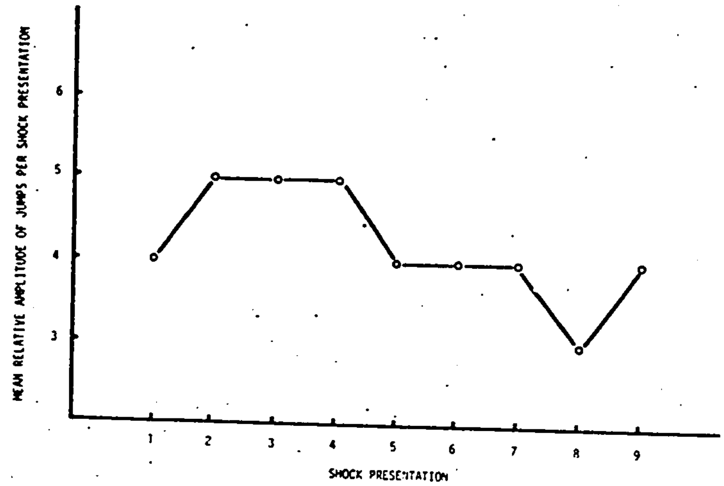


FIGURE 17. Mean relative amplitude of jumps per shock presentation as a function of shock presentation.

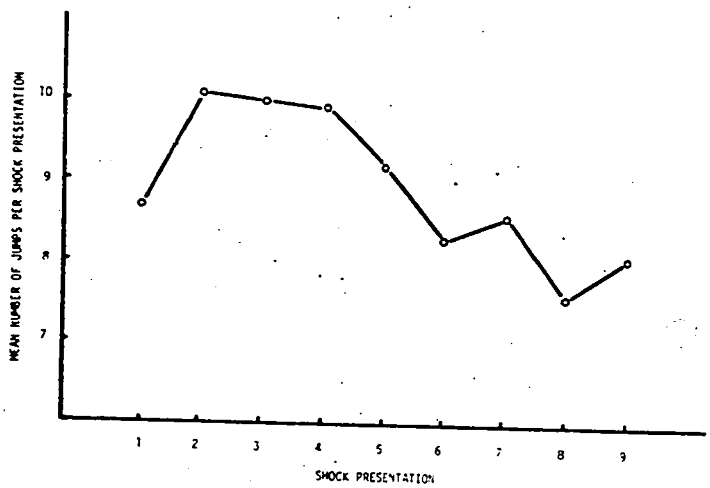


FIGURE 18. Mean number of jumps per shock presentation as a function of shock presentation.

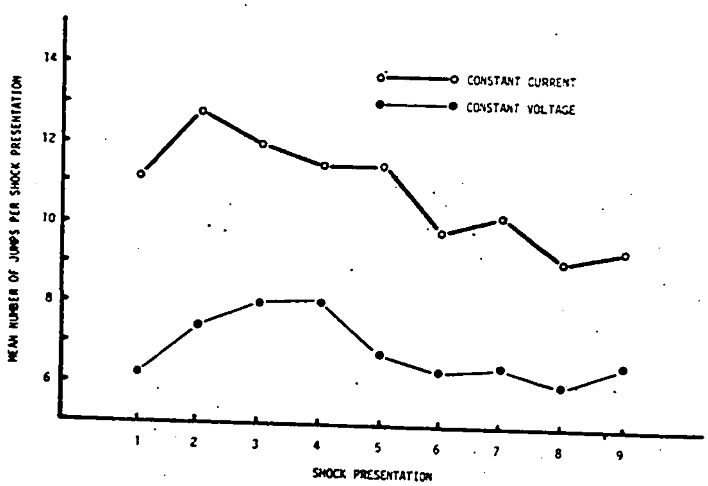


FIGURE 19. Mean number of jumps per shock presentation as a function of constancy and shock presentation.

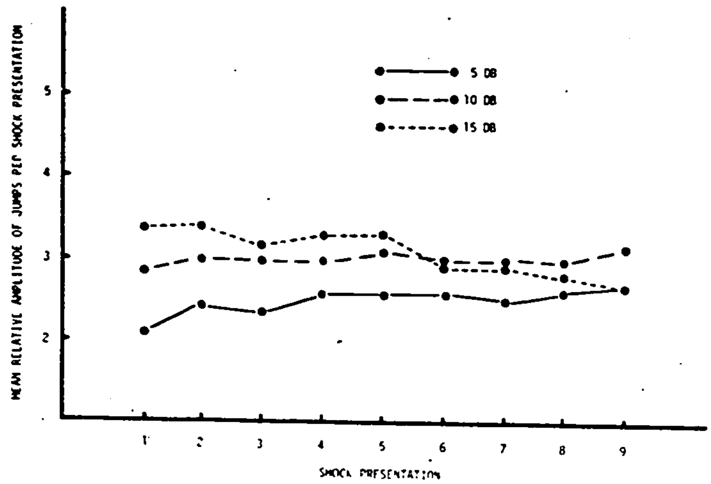


FIGURE 20. Mean relative amplitude of jumps per shock presentation as a function of intensity and shock presentation.

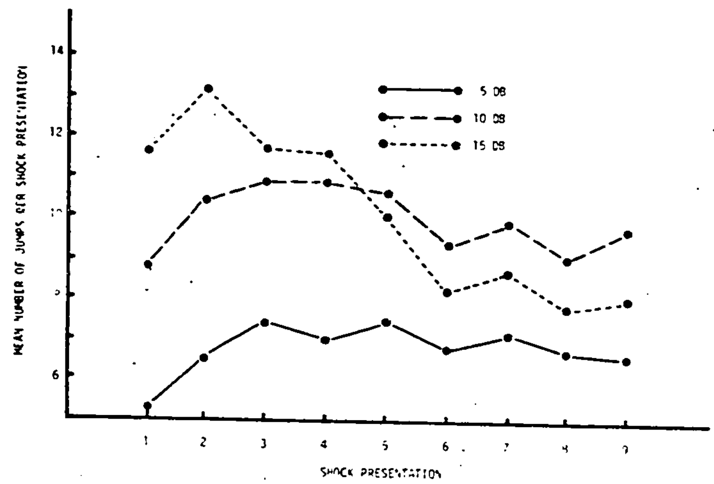


FIGURE 21. Mean number of jumps per shock presentation as a function of intensity and shock presentation.

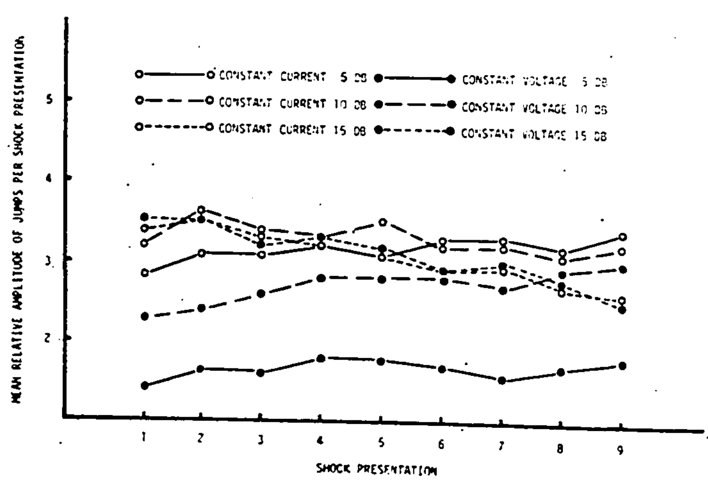


FIGURE 22. Mean relative amplitude of jumps per shock presentation as a function of constancy, intensity, and shock presentation.

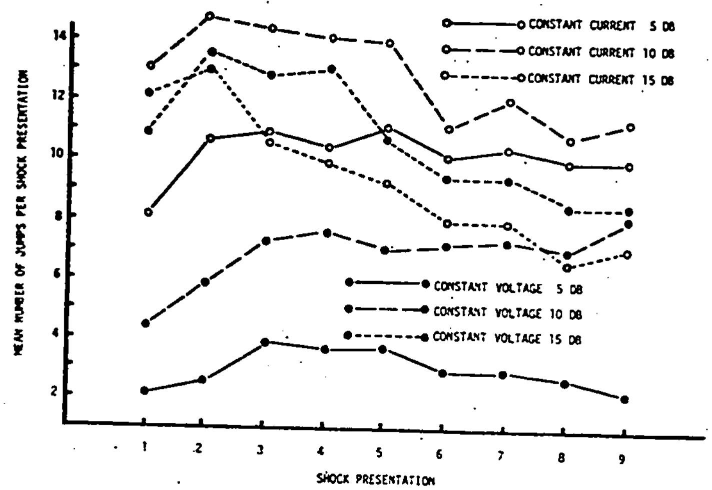


FIGURE 23. Mean number of jumps per shock presentation as a function of constancy, intensity, and shock presentation.

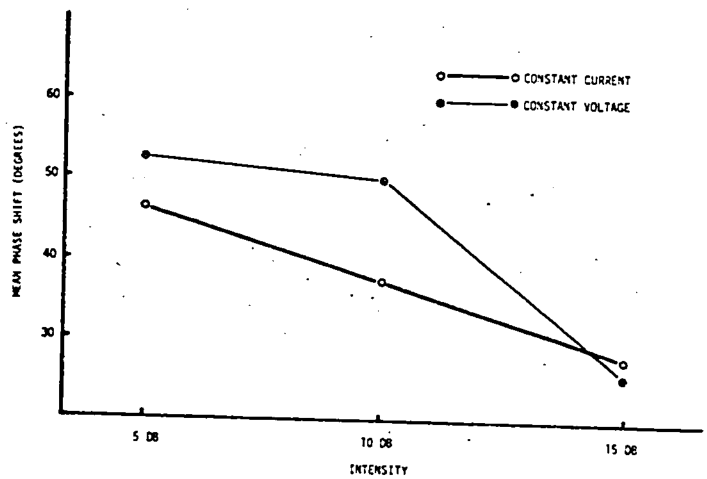


FIGURE 24. Mean sine-wave phase shift as a function of constancy and intensity.

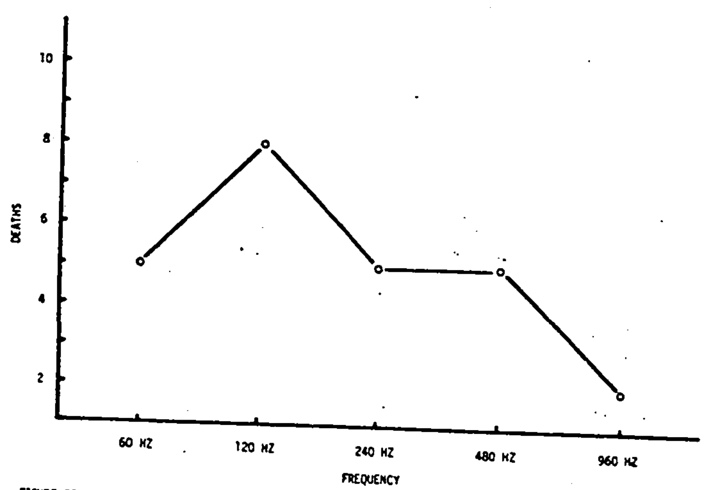


FIGURE 25. Deaths during response acquisition as a function of frequency.

RETENTION TEST ONE ANALYSES

The crossover and the freezing response data were analyzed using a 2 x 2 x 3 analysis of variance with the mode of constancy, waveform, and the intensity being the variables.[17] Summaries of these analyses appear in Tables 7 to 12.

The crossover analysis showed a significant constancy effect (F = 35.522, df = 1/348, p<.0005) with the mean number of crossovers increasing from 10.1 following constant current stimulation to 17.6 following constant voltage stimulation. A significant effect of intensity on the number of crossovers was also shown (F = 5.104, df = 2/348, p<.01) with the mean number of crossovers decreasing from 15.8 for the 5 db groups, to 14.7 for the 10 db groups, and to 11.1 for the 15 db intensity groups.

The constancy x waveform interaction was also significant (F = 5.064, df = 1/348, p<.025). While under the constant current condition, as shown in Figure 26, sine-wave stimulation resulted in a lower mean number of crossovers, under the constant voltage condition, sine-wave stimulation elicited a greater mean number of crossovers. The constancy x waveform x intensity interaction (F = 5.826, df = 2/348, p<.005) shows a greater mean number of crossovers for the constant voltage sine-wave groups than for the constant voltage square-wave groups at all intensities. For the constant current groups, however, sine-wave stimulation resulted in a greater mean number of crossovers only at the lowest intensity, as shown in Figure 27.

[17]Although no shock was administered during either retention test, the method of identifying the experimental groups by reference to the response acquisition stimulus conditions, is retained in the retention test results. Response conditions so identified are, therefore, those which existed during response acquisition.

Three significant main effects were identified by the analysis of variance of the total-freezing responses in the black and white compartments combined; those of constancy (F = 39.442, df = 1/348, p<.0005), waveform (F = 6.548, df = 1/348, p<.025), and intensity (F = 6.841, df = 2/348, p<.005). Less freezing (a mean duration of 522.6 seconds) resulted from constant voltage stimulation than from constant current stimulation, which elicited a mean of 688.5 seconds freezing. Under sine-wave conditions, a mean of 571.7 seconds occurred, a duration that was significantly shorter than the mean of 639.3 seconds occurring under square-wave stimulation. The mean duration of freezing increased, as the intensity was increased, in a near-linear fashion from 545.8 seconds at 5 db, to 605.2 seconds at 10 db, and to 665.5 seconds at the highest intensity.

Only the constancy x waveform interaction was significant in the analysis of total-freezing (F = 11.618, df = 1/348, p<.001). As depicted in Figure 28, there was less mean freezing resulting from constant voltage stimulation than from constant current stimulation for both sine and square wave, although the decrease was greater for sine-wave stimulation.

As with the response acquisition data, the total-freezing response was composed of two subscores, freezing in the black compartment and freezing in the white compartment. There were in the analysis of freezing in the black compartment, no significant main effects or interactions. However, in the analysis of freezing in the white compartment, there was a significant difference due to constancy (F = 11.254, df = 1/348, p<.001) where the mean of 361.8 seconds freezing resulting from constant current stimulation decreased to a mean of 257.4 seconds freezing under constant voltage. There was also a significant effect of intensity (F = 3.975,

df = 2/348, p<.025) with the least mean duration of freezing displayed by the 10 db groups (309.6 seconds). For the 5 db groups, the mean duration of freezing was 342.7 seconds, and for the 15 db groups, 485.9 seconds.

Because the duration of freezing occurring in each compartment was influenced by the time spent in that compartment, the freezing scores for each compartment were expressed, as suggested by Hawkins (1964), as a percentage of the time spent in that compartment.

The analysis of the percentage-freezing in the black compartment revealed a significant main effect due to constancy (F = 7.170, df = 1/348, p<.01). The mean percentage-freezing for constant constant current was 44.1, decreasing to 35.6 per cent for constant voltage. The constancy x waveform interaction was also significant (F = 8.003, df = 1/348, p<.005). While the mean percentage of freezing for square-wave stimulation remained relatively unchanged (41.8 per cent under constant current and 42.3 per cent under constant voltage), the mean percentage of freezing decreased from 46.2 per cent following sine-wave constant current stimulation to 28.9 per cent following sine-wave constant voltage stimulation. This interaction is depicted graphically in Figure 29.

Only one significant main effect, that of constancy (F = 14.497, df = 1/348, p<.0005), was identified by the analysis of the percentage-freezing in the white compartment. The mean percentage-freezing score of 40.9 following constant current conditions decreased to a mean of 30.7 per cent following constant voltage stimulation.

TABLE 7

Summary of Analysis of Variance of Total Crossovers during Retention Test One as a Function of Constancy, Waveform, and Intensity

SOURCE	MS	DF	F
CONST (A)	5107.600	1	35.522 [6]
WV-FRM (B)	122.500	1	0.852
INTEN (C)	733.811	2	5.104 [3]
A x B	728.178	1	5.064 [2]
A x C	400.133	2	2.783
B x C	106.033	2	0.737
A x B x C	837.678	2	5.826 [4]
ERROR	143.786	348	

[2] $p < .025$

[3] $p < .01$

[4] $p < .005$

[6] $p < .0005$

TABLE 8

Summary of Analysis of Variance of Total-Freezing during Retention Test One as a Function of Constancy, Waveform, and Intensity

SOURCE	MS	DF	F
CONST (A)	2478692.000	1	39.443[6]
WV-FRM (B)	411519.000	1	6.548[2]
INTEN (C)	429875.000	2	6.841[4]
A x B	730129.000	1	11.618[5]
A x C	92300.000	2	1.469
B x C	52806.500	2	0.840
A x B x C	104331.500	2	1.660
ERROR	62482.247	348	

[2] $p<.05$

[4] $p<.005$

[5] $p<.001$

[6] $p<.0005$

TABLE 9

Summary of Analysis of Variance of Freezing in the Black Compartment during Retention Test One as a Function of Constancy, Waveform, and Intensity

SOURCE	MS	DF	F
CONST (A)	340595.500	1	3.208
WV-FRM (B)	35746.000	1	0.337
INTEN (C)	4939.500	2	0.047
A x B	378516.500	1	3.565
A x C	15521.375	2	0.146
B x C	23541.250	2	0.222
A x B x C	56270.375	2	0.530
ERROR	106176.360	348	

TABLE 10

Summary of Analysis of Variance of Freezing in the White Compartment during Retention Test One as a Function of Constancy, Waveform, and Intensity

SOURCE	MS	DF	F
CONST (A)	981589.000	1	11.254[5]
WV-FRM (B)	204674.000	1	2.347
INTEN (C)	346726.500	2	3.975[2]
A x B	57223.500	1	0.656
A x C	71766.750	2	0.823
B x C	73316.500	2	0.841
A x B x C	100691.000	2	1.154
ERROR	87219.343	348	

[2] $p<.025$

[5] $p<.001$

TABLE 11

Summary of Analysis of Variance of Percentage-Freezing in Black Compartment during Retention Test One as a Function of Constancy, Waveform, and Intensity

SOURCE	MS	DF	F
CONST (A)	6526.172	1	7.170[3]
WV-FRM (B)	1707.641	1	1.876
INTEN (C)	299.238	2	0.329
A x B	7284.797	1	8.003[4]
A x C	79.453	2	0.087
B x C	556.047	2	0.611
A x B x C	711.422	2	0.782
ERROR	910.245	348	

[3] $p < .01$

[4] $p < .005$

TABLE 12

Summary of Analysis of Variance of Percentage-Freezing in White Compartment during Retention Test One as a Function of Constancy, Waveform, and Intensity

SOURCE	MS	DF	F
CONST (A)	9266.461	1	14.497[6]
WV-FRM (B)	991.887	1	1.552
INTEN (C)	1641.311	2	2.568
A x B	1611.939	1	2.521
A x C	343.939	2	0.538
B x C	211.945	2	0.332
A x B x C	410.633	2	0.642
ERROR	639.191	348	

[6] $p<.0005$

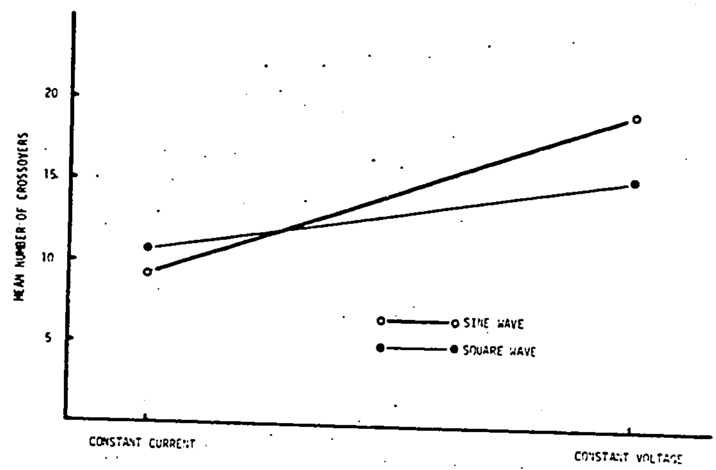


FIGURE 26. Mean number of crossovers as a function of constancy and waveform (collapsed over frequency) during retention test 1.

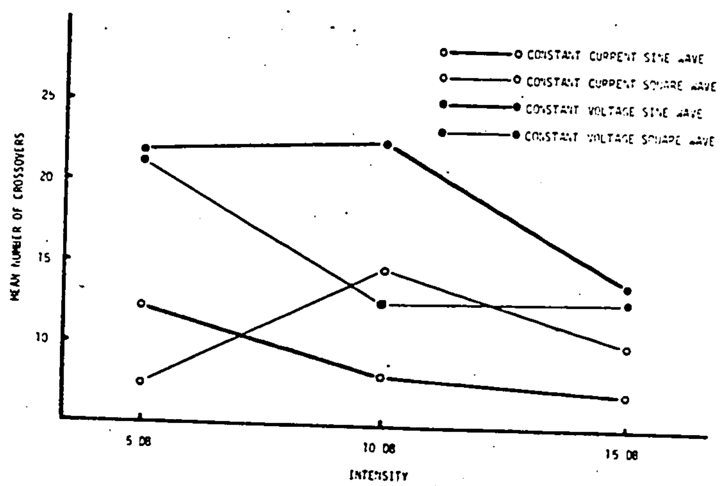


FIGURE 27. Mean number of crossovers as a function of constancy, waveform, and intensity (collapsed over frequency) during retention test 1.

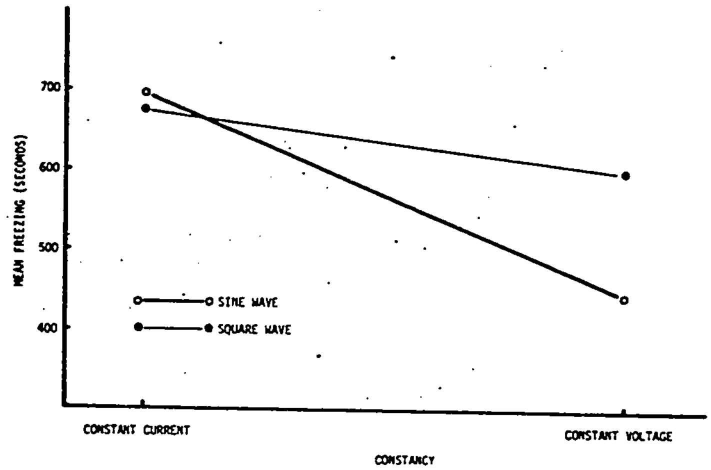


FIGURE 28. Mean total-freezing as a function of constancy and waveform (collapsed over frequency) during retention test 1.

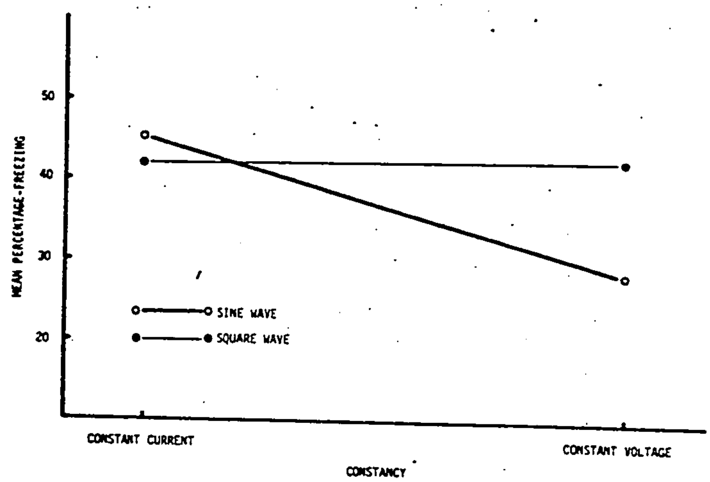


FIGURE 29. Mean percentage-freezing in the black compartment as a function of constancy and waveform (collapsed over frequency) during retention test 1.

RETENTION TEST TWO ANALYSES

The crossover and the freezing response data were also analyzed using a 2 x 2 x 3 analysis of variance. As in the first retention test, the variables were the mode of constancy, waveform, and intensity. These analyses are summarized in Tables 13 to 18.

There was a significant main effect of constancy ($F = 32.105$, $df = 1/348$, $p<.0005$) with a mean of 11.7 crosses resulting from constant current stimulation. The mean number of crossovers increased to 18.8 following constant voltage stimulation. In addition, there was a significant effect exerted by intensity on the number of crossovers ($F = 3.063$, $df = 2/348$, $p<.05$), with the mean number of crossovers decreasing from 17.4 at 5 db, to 14.7 at 10 db, and to 13.6 at the 15 db intensity level.

The analysis of total-freezing showed a significant effect due to constancy ($F = 17.745$, $df = 1/348$, $p<.0005$). A mean of 567.2 seconds total-freezing resulted from constant current stimulation, and a mean of 462.8 seconds resulted from constant voltage stimulation. This analysis further revealed a significant effect of intensity on freezing ($F = 3.691$, $df = 2/348$, $p<.025$). The mean duration of freezing increased as the intensity increased, with a mean of 469.5 seconds freezing at the 5 db level, a mean of 525.9 seconds at 10 db, and a mean of 549.8 seconds freezing at the 15 db intensity level.

Constancy, waveform, and intensity interacted to produce a significant difference in the mean duration of freezing ($F = 3.610$, $df = 2/348$, $p<.05$). For the constant current square-wave groups, the mean duration of freezing decreased as the intensity increased, as shown in Figure 30. Under the three remaining conditions, the mean duration of freezing increased with the increasing intensity. There was a greater mean duration of freezing at the two lowest intensities resulting from sine- and square-wave constant current, and at the highest intensity from the constant current sine-wave stimulation.

The analysis of freezing in the black compartment during Test 2, as with the first test, showed no significant main effects or interactions. In the white compartment, however, constancy had an effect on behavior ($F = 14.857$, $df = 1/348$, $p<.0005$). The mean of 336.9 seconds freezing following constant current stimulation was significantly greater than the mean of 233.6 seconds freezing which resulted from the prior constant voltage stimulation. The constancy x waveform x intensity interaction was also significant ($F = 3.073$, $df = 2/348$, $p<.05$) and is shown in Figure 31. The constant current sine-wave function indicates that the mean duration of freezing increased as a function of intensity. However, the mean duration of freezing under constant current square-wave stimulation decreased as the intensity increased, and was least at the 10 db level.

Both the constant voltage sine-wave and constant voltage square-wave functions indicate a greater mean duration of freezing after stimulation at the 10 db level than at either the 5 db or the 15 db intensity level.

The analysis of the percentage-freezing in the black compartment revealed no significant main effects and only one significant interaction, that of constancy x intensity ($F = 4.732$, $df = 2.348$, $p<.01$). In this case, as is illustrated in Figure 32, constant current stimulation elicited a greater mean duration of freezing only at the two lowest intensities.

It was indicated by the analysis of percentage-freezing in the white compartment that there was a significant difference attributable to the constancy factor (F = 12.469, df = 1/348, p<.0005) where a mean of 36.8 per cent freezing occurred after constant current stimulation and 28.7 per cent after constant voltage stimulation. The plot of the significant constancy x waveform x intensity interaction in Figure 33 (F = 4.488, df = 2/348, p<.05) shows an interactive pattern similar to that of the same interaction in the analysis of freezing in the white compartment.

TABLE 13

Summary of Analysis of Variance of Total Crossovers during Retention Test Two as a Function of Constancy, Waveform, and Intensity

SOURCE	MS	DF	F
CONST (A)	4629.669	1	32.105[6]
WV-FRM (B)	0.336	1	0.002
INTEN (C)	441.664	2	3.063[1]
A x B	20.069	1	0.139
A x C	180.145	2	1.249
B x C	3.245	2	0.023
A x B x C	396.744	2	2.751
ERROR	144.205	348	

[1] $p < .05$

[6] $p < .0005$

TABLE 14

Summary of Analysis of Variance of Total-Freezing during Retention Test Two as a Function of Constancy, Waveform, and Intensity

SOURCE	MS	DF	F
CONST (A)	981388.000	1	17.745 [6]
WV-FRM (B)	33744.000	1	0.610
INTEN (C)	204113.500	2	3.691 [2]
A x B	14978.000	1	0.271
A x C	137581.500	2	2.488
B x C	54587.500	2	0.987
A x B x C	199646.000	2	3.610 [1]
ERROR	55304.928	348	

[2] $p < .025$

[6] $p < .0005$

TABLE 15

Summary of Analysis of Variance of Freezing in the Black Compartment during Retention Test Two as a Function of Constancy, Waveform, and Intensity

SOURCE	MS	DF	F
CONST (A)	90.750	1	0.001
WV-FRM (B)	42781.500	1	0.550
INTEN (C)	31478.125	2	0.405
A x B	227855.750	1	2.930
A x C	190295.750	2	2.447
B x C	10855.500	2	0.140
A x B x C	892.000	2	0.011
ERROR	77765.800	348	

TABLE 16

Summary of Analysis of Variance of Freezing in the White Compartment during Retention Test Two as a Function of Constancy, Waveform, and Intensity

SOURCE	MS	DF	F
CONST (A)	965086.500	1	14.857[6]
WV-FRM (B)	595.750	1	0.009
INTEN	101631.000	2	1.565
A x B	125499.250	1	1.932
A x C	97478.500	2	1.501
B x C	25706.375	2	0.396
A x B x C	199612.250	2	3.073
ERROR	64959.759	348	

[6] $p < .0005$

TABLE 17

Summary of Analysis of Variance of Percentage-Freezing in Black Compartment during Retention Test Two as a Function of Constancy, Waveform, and Intensity

SOURCE	MS	DF	F
CONST (A)	1912.707	1	2.772
WV-FRM (B)	310.168	1	0.449
INTEN (C)	176.752	2	0.256
A x B	1867.758	1	2.707
A x C	3265.543	2	4.732[3]
B x C	8.719	2	0.013
A x B x C	6.682	2	0.010
ERROR	690.081	348	

[3] $p < .01$

TABLE 18

Summary of Analysis of Variance of Percentage-Freezing in White Compartment during Retention Test Two as a Function of Constancy, Waveform, and Intensity

SOURCE	MS	DF	F
CONST (A)	1912.707	1	2.772
WV-FRM (B)	310.168	1	0.449
INTEN (C)	176.752	2	0.256
A x B	1867.758	1	2.707
A x C	3265.543	2	4.732 [3]
B x C	8.719	2	0.013
A x B x C	6.682	2	0.010
ERROR	690.081	348	

[3] $p < .01$

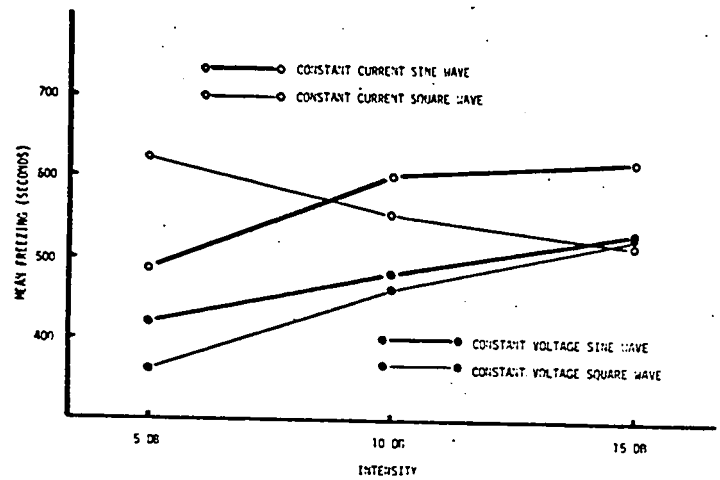


FIGURE 30. Mean total-freezing as a function of constancy, waveform, and intensity (collapsed over frequency) during retention test 2.

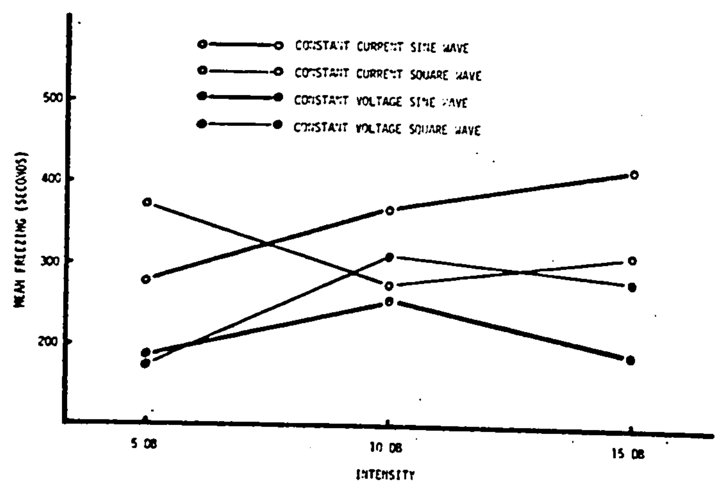


FIGURE 31. Mean freezing in the white compartment as a function of constancy, waveform, and intensity (collapsed over frequency) during retention test 2.

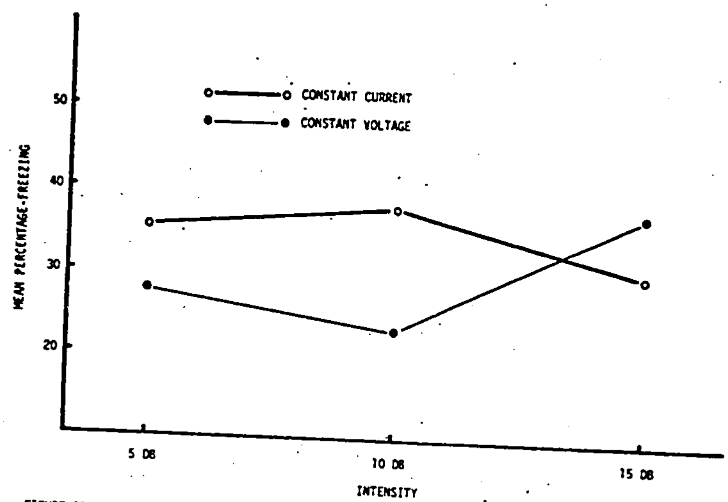


FIGURE 32. Mean percentage-freezing in the black compartment as a function of constancy and intensity (collapsed over frequency) during retention test 2.

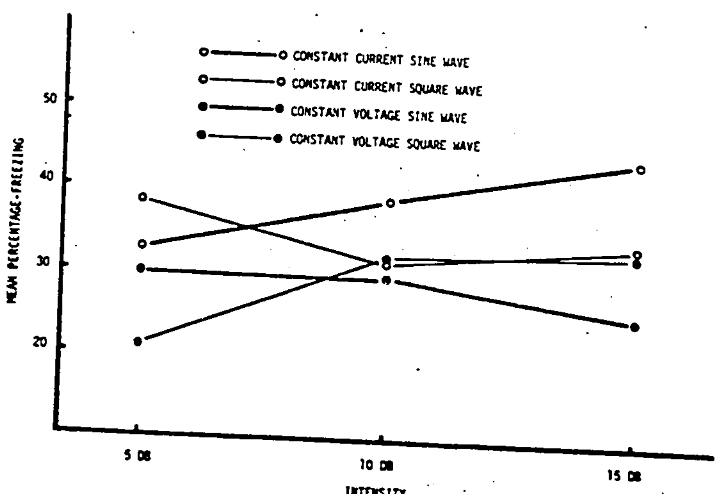


FIGURE 33. Mean percentage-freezing in the white compartment as a function of constancy, waveform, and intensity (collapsed over frequency) during retention test 2.

INTER-RETENTION TESTS ANALYSES

The Test 1—Test 2 data were analyzed using a 2 x 2 x 3 x 2 repeated measures analysis of variance. The mode of constancy, the waveform, and the intensity were the nonrepeated variables, and the Test 1—Test 2 time dimension formed the repeated measure. Tables 19 to 24 are summaries of these analyses. Because it was the effects of the time between the two retention tests that were of interest in these analyses, only the main effects of time and those interactions which included the time dimension are reported.

Time had a significant effect on the number of crossovers (F = 5.043, df = 1/348, p<.025) where the mean number of crossovers increased from 13.9 during Test 1 to 15.3 during Test 2.

The total-freezing also showed an effect over time (F = 56.070, df = 1/348, p<.0005) as the mean of 605.5 seconds freezing during Test 1 was reduced to 515.0 seconds mean freezing during Test 2. The significant constancy x time interaction (F = 6.453, df = 2/348, p<.025), plotted in Figure 34, illustrates the greater mean freezing resulting from the constant current condition, and the greater rate of decrease in mean freezing occurring after constant current stimulation between the tests. Figure 35 illustrates the significant waveform x time interaction (F = 12.903, df = 1/348, p<.0005) in which the decrease in the mean duration of freezing between tests was greater in the square-wave stimulation groups. The constancy x waveform x time interaction of the total-freezing analysis was significant as well (F = 18.203, df = 1/348, p<.0005). While the constant voltage sine-wave function indicates a greater mean duration of freezing occurred during the second test, the constant current sine-wave, constant current and constant voltage square-wave functions all show lesser mean durations of freezing during Test 2, as shown in Figure 36. The constancy x waveform x intensity x time interaction was significant (F = 3.525, df = 2/348, p<.05). With the exceptions of the constant voltage sine-wave 5 db and 10 db groups, the mean durations of freezing were less during Test 2. This interaction is summarized in Table 25.

The analysis of freezing in the black compartment showed a significant effect of time (F = 13.615, df = 1/348, p<.0005) with the mean duration of freezing decreasing from 295.9 seconds during Test 1 to 229.8 seconds during Test 2. There was also in this analysis, a significant constancy x waveform x time interaction (F = 10.333, df = 1/348, p<.005). While the mean duration of freezing increased from Test 1 to Test 2 for the constant voltage sine-wave groups, the mean duration decreased for the remaining groups as shown in Figure 37.

The time variable did not result in any significant main effect or interaction in the analysis of freezing in the white compartment. There was a significant effect of time in the analysis of percentage-freezing in the black compartment (F = 17.512, df = 1/348, p<.0005). The mean percentage-freezing decreased from 39.8 during Test 1 to 32.2 during Test 2. There was also in this analysis, a significant constancy x intensity x time interaction (F = 14.560, df = 1/348, p<.0005). This interaction, as plotted in Figure 38, reflects the decrease in the mean freezing between tests for both sine- and square-wave stimulation groups.

The final analysis, that of percentage-freezing in the white compartment, showed a significant decrease in the mean percentage-freezing (F = 4.114, df = 1/348, p<.05) from 35.8 during Test 1 to 32.8 during Test 2.

TABLE 19

Summary of Analysis of Variance of Total Crossovers between Retention Tests as a Function of Constancy, Waveform, and Intensity

SOURCE	MS	DF	F
CONST (A)	9731.4004	1	44.133[6]
WV-FRM (B)	67.8340	1	0.308
INTEN (C)	1073.2383	2	4.867
A x B	495.0137	1	2.245
A x C	551.1729	2	2.500
B x C	72.9395	2	0.331
A x B x C	1184.2656	2	5.371
ERROR	220.5038	348	
TIME (E)	340.3125	1	5.043
A x E	5.8691	1	0.087
B x E	55.0020	1	0.815
C x E	102.2168	2	1.515
A x B x E	253.2344	1	3.752
A x C x E	29.1064	2	0.431
B x C x E	36.3389	2	0.538
A x B x C x E	50.1563	2	0.743
ERROR	67.4869	348	

[6] $p < .0005$

TABLE 20

Summary of Analysis of Variance of Total-Freezing between Retention Tests as a Function of Constancy, Waveform, and Intensity

SOURCE	MS	DF	F
CONST (A)	3290062.0000	1	35.818[6]
WV-FRM (B)	105648.0000	1	1.150
INTEN (C)	605417.0000	2	6.591[2]
A x B	266860.0000	1	2.905
A x C	225752.0000	2	2.458
B x C	106526.0000	2	1.160
A x B x C	211126.0000	2	2.298
ERROR	91853.9189	348	
TIME (E)	1474230.0000	1	56.070[6]
A x E	169664.0000	1	6.453[2]
B x E	339260.0000	1	12.903[6]
C x E	28395.0000	2	1.080
A x B x E	478604.0000	1	18.203[6]
A x C x E	4305.0000	2	0.164
B x C x E	1044.0000	2	0.040
A x B x C x E	92676.0000	2	3.525[1]
ERROR	26292.7183	348	

[1] $p<.05$

[2] $p<.025$

[6] $p<.0005$

TABLE 21

Summary of Analysis of Variance of Freezing in the Black Compartment between Retention Tests as a Function of Constancy, Waveform, and Intensity

SOURCE	MS	DF	F
CONST (A)	175223.5000	1	1.389
WV-FRM. (B)	285.5000	1	0.002
INTEN (C)	28198.2500	2	0.224
A x B	9383.0000	1	0.074
A x C	97019.5000	2	0.769
B x C	24829.2500	2	0.197
A x B x C	23321.7500	2	0.185
ERROR	126161.3447	348	
TIME (E)	786669.5000	1	13.615 [6]
A x E	165401.0000	1	2.863
B x E	78180.0000	1	1.353
C x E	8188.7500	2	0.142
A x B x E	597051.5000	1	10.333 [4]
A x C x E	108828.2500	2	1.833
B x C x E	9597.7500	2	0.166
A x B x C x E	33809.7500	2	0.585
ERROR	57780.5947	348	

[4] $p < .005$

[6] $p < .0005$

TABLE 22

Summary of Analysis of Variance of Freezing in the White Compartment between Retention Tests as a Function of Constancy, Waveform, and Intensity

SOURCE	MS	DF	F
CONST (A)	1946732.0000	1	19.961[6]
WV-FRM (B)	113413.5000	1	1.163
INTEN (C)	381433.7500	2	3.911[2]
A x B	176016.5000	1	1.805
A x C	51957.5000	2	0.533
B x C	92807.2500	2	0.952
A x B x C	284549.0000	2	2.918
ERROR	97526.7607	348	
TIME (E)	107117.5000	1	1.960
A x E	-138.0000	1	-0.003 *
B x E	91775.0000	1	1.679
C x E	66882.7500	2	1.224
A x B x E	6788.0000	1	0.124
A x C x E	117328.5000	2	2.147
B x C x E	6255.7500	2	0.114
A x B x C x E	15714.0000	2	0.288
ERROR	54652.1118	348	

[2] $p<.025$

[6] $p<.0005$

* The computer can carry in the order of nine significant figures. If the number of figures in the largest number in the calculation, *i.e.*, ΣX^2, exceeds this, then the excess must be considered as round-off error. Since the sums of squares in the table involve differences between several such large numbers it is possible for the result, if small enough in comparison with the significant digits carried, to consist entirely of round-off error, either positive or negative. That it was not an error in the analysis of variance program was indicated by the fact that when the data were analyzed by a different analysis of variance program which included the frequency variable, the main effects sums of squares remained unchanged.

TABLE 23

Summary of Analysis of Variance of Percentage-Freezing in Black Compartment between Retention Tests as a Function of Constancy, Waveform, and Intensity

SOURCE	MS	DF	F
CONST (A)	7753.7656	1	7.510[3]
WV-FRM (B)	283.7344	1	0.275
INTEN (C)	129.3477	2	0.125
A x B	885.0938	1	0.857
A x C	1738.2070	2	1.684
B x C	211.4180	2	0.205
A x B x C	300.9102	2	0.291
ERROR	1032.4257	348	
TIME (E)	9945.3047	1	17.512[6]
A x E	683.9453	1	1.204
B x E	1732.9219	1	3.051
C x E	346.0547	2	0.609
A x B x E	8268.6016	1	14.560[6]
A x C x E	1607.3750	2	2.830
B x C x E	353.9219	2	0.623
A x B x C x E	416.6211	2	0.734
ERROR	567.8975	348	

[3] $p < .01$

[6] $p < .0005$

TABLE 24

Summary of Analysis of Variance of Percentage-Freezing in White Compartment between Retention Tests as a Function of Constancy, Waveform, and Intensity

SOURCE	MS	DF	F
CONST (A)	15055.7422	1	21.033[6]
WV-FRM (B)	128.3359	1	0.179
INTEN (C)	1805.2422	2	2.522
A x B	1871.2656	1	2.614
A x C	107.7305	2	0.151
B x C	128.8320	2	0.180
A x B x C	2094.7266	2	2.926
ERROR	715.8109	348	
TIME (E)	1654.1094	1	4.114[1]
A x E	178.4688	1	0.444
B x E	1106.4297	1	2.752
C x E	224.9414	2	0.559
A x B x E	184.3281	1	0.458
A x C x E	555.6367	2	1.382
B x C x E	92.9023	2	0.231
A x B x C x E	463.6484	2	1.153
ERROR	402.0475	348	

[1] $p < .05$

[6] $p < .0005$

TABLE 25

Summary of Mean Freezing (seconds, collapsed over Frequency) in the Constancy x Waveform x Intensity x Time Interaction of the Analysis of Variance of Freezing in the White Compartment

STIMULUS CONDITIONS		TEST 1	TEST 2
CONSTANT CURRENT SINE WAVE	5 DB	621.073	488.143
	10 DB	743.323	603.877
	15 DB	734.820	619.267
CONSTANT CURRENT SQUARE WAVE	5 DB	684.417	621.847
	10 DB	646.053	554.480
	15 DB	701.313	515.923
CONSTANT VOLTAGE SINE WAVE	5 DB	357.800	421.993
	10 DB	406.837	482.100
	15 DB	566.490	532.860
CONSTANT VOLTAGE SQUARE WAVE	5 DB	519.917	345.957
	10 DB	624.923	462.993
	15 DB	659.343	531.143

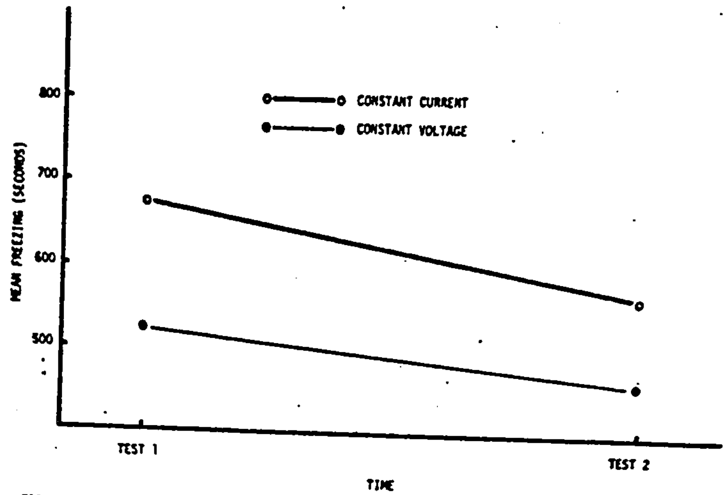


FIGURE 34. Mean total-freezing as a function of constancy and time between retention tests (collapsed over frequency).

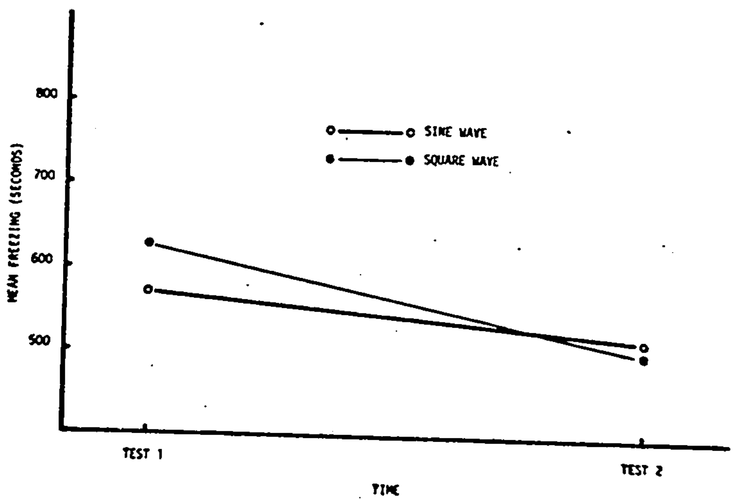


FIGURE 35. Mean total-freezing as a function of waveform and time between retention tests (collapsed over frequency).

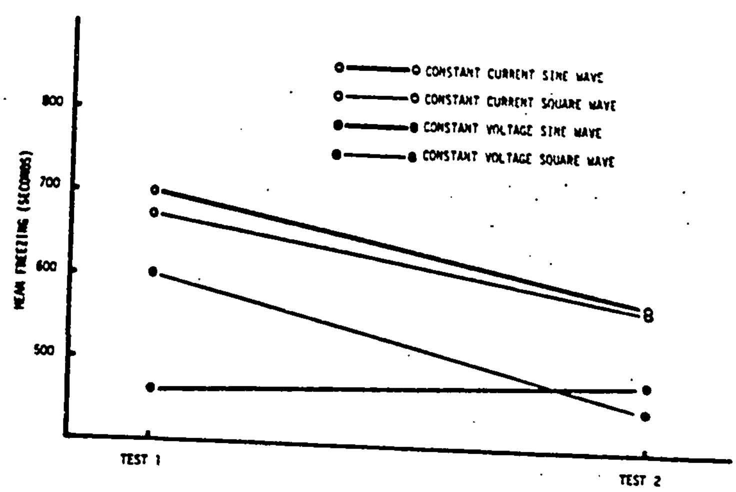


FIGURE 36. Mean-total freezing as a function of constancy, waveform, and time between retention tests (collapsed over frequency).

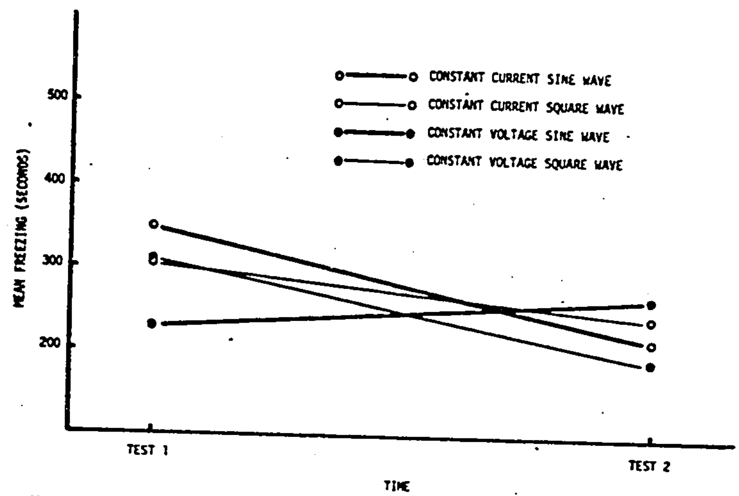


FIGURE 37. Mean freezing in the black compartment as a function of constancy, waveform, and time between retention tests (collapsed over frequency).

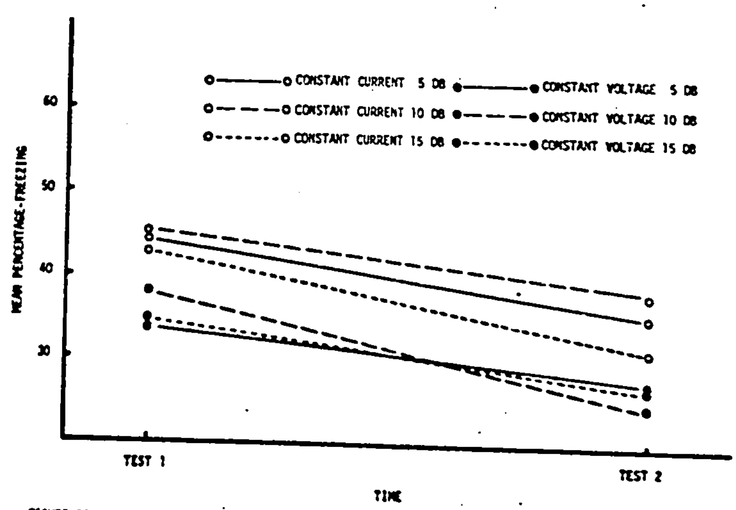


FIGURE 38. Mean percentage-freezing in the black compartment as a function of constancy, intensity, and time between retention tests (collapsed over frequency).

DISCUSSION

The results of this thesis have demonstrated significant relationships between parameters of electric shock stimulation and behavior. They have also demonstrated that not all behavioral responses are influenced by the same dimensions of electric shock, and that behavioral differences result with time after stimulation.

The measurement of the freezing response was of particular interest in this investigation since it was earlier suggested (Campbell & Teghtsoonian, 1958; Colman, 1966; Hawkins, 1964; McClelland & Colman, 1967) that constant current stimulation elicits freezing in a nonescapable situation because the immobile behavior maximizes the area of tissue in contact with the grid bars, and thus decreases the density of current in the tissues. Colman (1966), and McClelland and Colman (1967) have recently shown that more freezing does occur following constant current stimulation than constant voltage stimulation. The results of the present study confirm this finding.

The lack of a significant difference between the duration of freezing under constant current stimulation and duration of freezing under constant voltage stimulation in the black (shock) compartment during response acquisition, however, appears inconsistent with the current density hypothesis, for at the two lowest intensities, the greatest freezing was shown by the constant voltage square wave groups. Freezing in the black compartment increased with intensity for both the constant voltage sine wave and the constant current square wave groups.

In the white compartment during response acquisition, the greater duration of freezing shown by the constant current groups appears to be limited to the low intensity and sine wave groups. At the 15 db intensity level, the differences appear minimal. These conditions are reflected in the analysis of total-freezing during response acquisition.

Contrary to what might have been expected from a consideration of the current density hypothesis, these results indicate that the mode of constancy exerted little effect on freezing behavior. Rather, the intensity and the waveform of the stimulation appear to be the more important factors.

Also not consistent with the current density hypothesis was the larger mean number of jumps per shock presentation which occurred under the constant current stimulation. Similar reversals were found in all significant jump and jump amplitude interactions which included the mode of constancy as one of the parameters.

It could be inferred from the current density hypothesis, that under constant current conditions, the rats would tend to freeze during the shock presentation, and would, therefore, exhibit minimal jumping activity. It is suggested by these reversals that the constant current stimuli were more intense than the constant voltage stimuli of the same decibel level. Because the phase shift decreased as the intensity increased, the smaller phase shift under constant current stimulation is indicative of a greater dissipation of power in the rat, and offers further support for the argument that the constant current stimulation was more intense than the constant voltage stimulation.

The assumption that the constant current aversion threshold can be determined by a method dependent upon perambulation, no longer seems tenable, because it is apparent that constant current stimulation, as it is increased from subliminal intensities, even in an escapable situation (Colman, 1966; Miller, 1948), depresses ambulatory behavior before causing it to increase. Therefore, the aversion threshold might be better determined by employing the previously described motor readiness concept of freezing (Bindra & Palfai, 1967), as the significant behavioral referent. An aversion threshold determined in this manner would be lower than the zero db intensity proposed by Campbell and Teghtsoonian (1958).

The greater intensity of the constant current stimulation might well have been the reason for the higher incidence, under constant current stimulation, of the behavior illustrated in Plates 2 and 3. This behavior was very similar to that described by Finger (1947) as occurring in an audiogenic seizure, and the posture illustrated in Plate 2 is similar to that in Figure 28 of a report by Braun, Russell & Patton (1949) who used electric shock delivered through ear electrodes to produce seizures. It is also similar to the posture shown in Plate 1 of the report by Colman (1966) who inadvertently produced seizures using grid electrode shock. What is surprising is not that this behavior should resemble an electroconvulsive or audiogenic seizure, but that seizures should have occurred at such seemingly low intensities.

Although the initial current levels used in this study were considerably lower than the currents of 20 milliamperes and more used by a number of investigators (Braun et al, 1949; Eriksen, Porter & Stone, 1948; Hayes, 1948; Townsend, Russell & Patton, 1949) to evoke seizures, it must be concluded that a similar current was flowing through the convulsed rats in this study.[17] As implied by the current density hypothesis, and as suggested by Littman et al. (1964), at the instant before a rat contacts the grid electrodes, the current density may be sufficiently great that a spark appears across the grid-tissue gap. Such a spark could burn a pinpoint hole at the interface, and thereby create a lowered resistance path through the cornified foot tissue.[18]

Because the reisitivities of body structures are different in different directions, depending upon the orientation of the cells (Geddes & Baker, 1966), the different orientations of the rat on the grids after successive jumps result in variations in the current paths within the rat, and thus, in the total resistance of the rat. On those occasions when the tissues in contact with a grid have been burned, the resulting low resistance paths would allow a greater current to flow, thus heightening this anisotropic effect in the tissues. Whenever the resistance was decreased below the controlled range of the shock source, the current level might well have been sufficently intense to elicit a seizure.

While this situation could occur under constant current or constant

---

[17]On a few of the occasions when convulsions were found to be occurring, the current flow was monitored, using a Simpson 635 voltohmeter. The current flow in these cases did exceed 20 milliamperes.

[18]Incisions were made in the foot pads of an anaesthetized rat. When one ohmeter lead was placed in the bleeding wound of one foot, and the other lead was placed concurrently in the bleeding wounds of the remaining three feet, the resistance measured 3KΩ. It can be assumed that in a rat under stress of electric shock stimulation, the body fluid resistance would be even less.

voltage conditions, the fact that seizures occurred more often with constant current stimulation offers further support for the argument of inequality between constant current and constant voltage intensities. That it was not a breakdown of control in the shock source which permitted the occurrence of seizures, but the lowered resistance of *S*s, is evident from the fact that not all *S*s showed convulsive behavior at the higher intensities[19], and also from the fact that a number of convulsed *S*s were found with their jaws locked around a grid bar even after the termination of shock. It would appear that this behavior, which was also reported, but not identified as convulsive, by Colman (1966), was elicited by the higher current flow allowed by the low resistance of the moist oral tissues.

It has been suggested, by the current density hypothesis, that the constant current mode of stimulation is an important factor in the increased acquisition of the freezing response. The acquisition of freezing under constant voltage stimulation, however, is not accounted for by this hypothesis. But, as pointed out earlier (Hawkins, 1964), the lack of activity in the white compartment immediately after shock might well be related to some physiological after-effect of shock. Such lack of activity, which includes the behavior illustrated in Plate 2, would necessarily have been recorded as freezing, and would have caused the measure to be spuriously high.

During retention testing, those rats which had been stimulated with constant current shock moved less often and more slowly during freezing than did those which had experienced constant voltage shock. These qualitative differences suggest that there may have been two separate responses recorded as freezing; the freezing learned under constant current stimulation, and a cessation of ambulatory behavior characteristic of constant voltage stimulation.

If no fractional reduction of stimulus intensity results from immobile behavior during constant voltage stimulation, the rat would continue to jump during shock presentations. The onset of the shock could, therefore, become the conditioned stimulus for jumping. Although jumping was not recorded during retention testing, it was noticed that very few jumps occurred. During retention testing, therefore, the response learned to constant voltage stimulation was not elicited and the rat was able to move about the cage. As the retention test progressed, it could be expected that the rat would eventually cease explorative activity and, perhaps, rest. It is suggested that much of the "freezing" recorded after constant voltage stimulation was such resting behavior. On subsequent exposure to the experimental cage, such resting behavior should occur earlier in the test period. The increases in freezing which occurred with the constant voltage sine wave groups between retention tests lends support to this interpretation. In contrast, the rats previously subjected to constant current stimulation, often froze within seconds of being placed in the experimental cage. This hypothesis of differential freezing behavior resulting from constant current and constant voltage stimulation might be tested using a retention test lasting less than the 20 min used in this study.

This analysis of constant current and constant voltage stimulation, in the light of the current density hypothesis, might well suggest that the constant current mode is a sufficient condition for the acquisition of the freezing response. Therefore, *with respect to response acquisition,* it would appear unnecessary to postulate, as is done in the two-factor theory of learning (Miller, 1951; Mowrer, 1939), a reduction of a classically conditioned fear drive to account for the acquisition of this instrumentally conditioned response. However, because the freezing response is maintained for long periods in the absence of the primary drive, the postulation of some secondary process during the response acquisition period is necessary. Although Young (1961) has argued for an hedonic interpretation, and Brown and Jacobs (1949) considered a frustration explanation, the interpretation of reinforcement by the reduction of a learned fear drive has continued to receive support (Brown & Jacobs, 1949; Hawkins, 1964; McClelland, 1966; Robinson, 1963).

The Miller-Mowrer two factor theory of learning does seem to account adequately for the hurdle "crossing" behavior measured in the shuttle-box situation. As explained by Brown and Jacobs (1949), with respect to the previously discussed study by Miller (1948),:

> ...The results obtained on the learning trials indicated clearly that if the wheel-turning response occurred a few times early in the series it was then rapidly learned, apparently being reinforced by the reduction in fear accompanying escape into the black compartment. Thirteen out of 25 animals showed clear-cut evidence of learning the new response. On subsequent trials, when the wheel-turning response was made 'incorrect' for these 13 rats, it extinguished rapidly, and a new 'correct' response of pressing a bar to open the door was readily learned. Since no shock was administered on any of the learning trials, the results were interpreted as indicating that the fear aroused by the stimuli from the white [shock] compartment provided a drive which led to random activity and hence to the initial correct responses, and that the reduction in fear accompanying escape from the white box operated to reinforce the wheel-turning and bar-pressing responses...(p. 748).

Although the concept of learned fear explains the persistence of the freezing response in the absence of the primary drive, even given constant current stimulation, it does not adequately explain the *acquisition* of the response. A synthesis of the current density hypothesis and the concept of a learned fear drive would require one to predict that the performance of each of the jumping responses (number of jumps, and amplitude of jumps) would decrease from an initial maximum value as a monotonic function of the number of shock presentations. That is to say, that at the termination of each jump elicited by the electric shock stimulation, the reduction in current density resulting from the increase in the area of tissue contacting the grid electrodes would reinforce that activity which allows the maximum grid-tissue contact. This activity is freezing. Further reinforcement of this freezing behavior would result from the reduction of fear accompanying the reduction in the primary drive level. That the freezing acquisition process did not cause the performance levels of each of the jumping responses to decrease monotonically from an initial, maximum is cogently demonstrated by Figures 17 to 23 which illustrate the increases which occurred in the mean number of jumps per shock presentation, and the mean amplitude of jumps per shock presentation.

Bindra (1959) has stated that "noxious stimulation typically leads to an increase in level of arousal." (p. 238). He further suggested:

> ...The exact effects on arousal of the repetition of a given type of noxious stimulation, with no opportunity to escape, are not known. Under these conditions, whether the animal adapts to an electric shock probably depends on the intensity of the shock; adaptation is more likely to occur at low intensities. It is possible that, for some intensities of shock,

> there occurs a cumulative effect, so that the increase in arousal brought about by later shock is greater than that evoked by the initial ones. However, when an opportunity to escape or avoid the shock is provided, the increased-arousal response decreases with repetition of the shock or signal for shock" (Bindra, 1959, p. 239).

There has been, since this position was taken, a clarification of some aspects of noxious stimulation in a nonescapable situation. As Bindra suggested, adaptive responses may occur, although it has been indicated that such adaptive responses are dependent not only upon the intensity of stimulation, but also upon the circuit properties of the shock source employed, and although Bindra reported that the increased-arousal response decreases when escape or avoidance becomes possible, it has been shown in this investigation that such a decrease may result even in the nonescapable situation. While Bindra's arousal model does not wholly explain the acquisition of the freezing response in this study, it is, nonetheless, a valuable concept in that it requires the prediction that the performance of the jumping responses will not be asymptotic initially, but will increment over trials.

Since the acquisition of the freezing response, according to the current density hypothesis, is a complex process which has not yet been explained adequately, it would appear essential that the activity of the rat during the response acquisition period be more closely examined.

If a rat were standing immobile on the grid electrodes at the onset of the first presentation of a constant current shock, the area of tissue contacting the grids would be relatively large, and the current density through those tissues would be correspondingly low. Although it has been held that under constant current stimulation a rat would tend to remain immobile, it should be remembered that this argument is based upon a *reduction* in the current density. Therefore, the rat upon experiencing the noxious stimulation might be expected to jump in response to the onset of this shock. Hoffman, Fleshler and Abplanalp (1964), in their assessment of the startle reaction to electrical shock, found that rats subjected to constant current stimulation by grid electrodes did indeed jump, with latencies as short as 5 msec at a stimulus intensity of 0.2ma. With each subsequent noxious stimulation, as just suggested, there would be a cumulative increase in the level of arousal, which would be reflected in an increasing magnitude of performance of the jumping responses.

As the rat jumps from the grid, the area of tissue contacting the grid becomes progressively less and the current density in the tissue still contacting the grid becomes progressively greater, thus making the stimulation progressively more intense. This increase in the intensity of stimulation may be regarded as a noxious stimulus in itself, and being contingent upon the occurrence of the jumping response, the more intense stimulation may also be thought of as punishment. In this respect, it should be noted that Mowrer (1947) defined punishment as being "...a relatively sudden and painful increase of stimulation following the performance of some act" (p. 136).

When the rat breaks contact with the grid electrodes, the noxious stimulation is eliminated, thus reinforcing the jumping escape behavior. This escape from the noxious stimulation is only temporary, however, because the rat must return to the grids, there being no perch or "safe" area to which the rat can jump. As the rat again contacts the grids a situation similar to that existing when the rat left the grids, results in an intense stimulation at the instant of contact. This stimulation, also being contingent upon the jump response, is punishing. The jump response, therefore, being alternately punished, reinforced, and punished again, creates for the rat, a conflict situation which might be described as a single-response approach-avoidance conflict.

This conflict situation, according to the dynamogenic view, has arousal (Bindra, 1959) or drive (Brown & Farber, 1951) properties which result in increased responding as the degree of conflict is increased (Castaneda & Worell, 1961; Finger, 1941; Worell & Castaneda, 1961). It is to be expected, therefore, that the jumping responses would increase in number and in amplitude as a function of the number of shocks, and that the noxious stimulus arousal effects and the dynamogenic effects would be cumulative. It would also be predicted from the principle of dynamogenesis that an increase in the intensity of the stimulation would result in an increase in the level of performance.

After the rat lands on the grid, the force of the downward movement ensures that the area of tissue contacting the grid will increase, thus causing the current density to decrease. Since a reduction in noxious stimulation intensity has been found to be reinforcing (Campbell, 1956), that response which maintains the greatest tissue area in contact with the grid electrodes is thus reinforced. Similarly if the rat is moving about the cage when the first shock is presented, the movement of any limb from the grid floor results in a punishment, reinforcement, and punishment sequence. And, as is the case after a jump, the downward force of a limb on the grid will ensure that the grid-tissue area will increase, thereby causing a decrease in the current density and culminating in a reinforcement.

Although the noxious stimulus, because of the rat's behavior, has been reduced to a lower intensity, it remains aversive and the rat jumps again. As this behavior is repeated, fear having drive properties, is conditioned to the static cues of the shock compartment (*e.g.*, the black walls and grid floor), and acquires reinforcing and punishing values. Now when the rat jumps, each ensuing punishment is a compound punishment resulting from the intense noxious stimulation and from the accompanying increase in the level of the fear drive. Similarly, each reinforcement is a compound reinforcement resulting from the decrease in the intensity of the primary noxious stimulus, and from the accompanying decrease in the level of the secondary fear drive. The punishment and reinforcement associated with the fear drive make the conflict even stronger and would be expected to result in further increases in arousal or motivation.

After the rat lands on the grid bars, and after the initial intense stimulation, there is a reduction in the current density which, in the manner previously outlined, reinforces the immobile behavior. With continued reinforcement, the rat is able to form a discrimination between the stimulus intensities, and as the discrimination is formed, the acquisition of the instrumental response resolves the conflict produced by the jump response. As the conflict is resolved, the arousal level or dynamogenic drive level declines, and the level of performance of the jumping responses declines.

With constant voltage stimulation, the situation would be somewhat different. The only reinforcement comes from the escape, by jumping, from the noxious stimulus. Because jumping also results in punishment when the grids are again contacted, a conflict situation arises. And as happens with constant current stimulation, the drive level increases, and there is an increase in the performance of the jump response. According to the current density hypothesis, no reinforcement should occur when the rat contacts the grid bars after jumping. The rat, therefore, should continue to jump during shock. At the two lower constant voltage intensities, the rats did maintain an increased level of performance of the jumping response. The decrease in performance under the 15 db constant voltage stimulation might reasonably be attributed to the fatiguing, or paralyzing effects of the continued exposure to the high intensity stimulation.

This multi-factor analysis suggests that a rat being stimulated by noxious constant current shock in a nonescapable situation would initially respond by jumping. As the rat continued to jump, the number of jumps per shock (i.e., the rate of jumping) and the amplitude of the jumps would each increase to a maximum value. The time required to achieve these levels of performance varies inversely with the stimulus intensity, and after reaching a maximum, the level of performance of each of the jumping measures would decrease. Concurrently the performance level of freezing in the nonshock intervals would increase.

The functions illustrated in Figures 17 to 23, notwithstanding the fact that some are related to others, do show a large degree of consistency, and the constant current functions in Figures 22 and 23 illustrate the cumulative effects of the factors discussed in the analysis of the freezing response acquisition. These functions may be described in a general fashion by the expression:

$$\frac{N}{1 + N^2/c}$$

where N is the number of shock presentations, and c is a constant.

It is apparent from this investigation that the behavioral responses in the modified shuttle box situation are affected by parameters of electric shock stimulation, other than the mode of constancy. The effects of waveform, however, were confined almost solely to the response acquisition measures. Of the relevant measures made during the response acquisition period, only the amplitude of jumps measures showed no significant differences due to waveform. Of the retention test measures, only that of total-freezing in Test 1 showed a significant waveform effect. Where significant waveform differences were found in the freezing measures, square-wave stimulation resulted in greater mean durations of freezing. Square-wave stimulation also resulted, during response acquisition, in a greater mean number of jumps than did sine-wave stimulation

These results suggest that a higher intensity shock was experienced under the square-wave stimulation than under the sine-wave stimulation, because as the intensity of the stimulation increased, so, generally, did the mean duration of freezing, the mean number of jumps per shock, and the mean amplitude of the jumps. The consistency of these findings and the levels of confidence indicated by the analyses thus argue strongly against the equating of sine- and square-wave intensities by peak values.

Although the sine and square waves used in this study were equal in terms of their peak values at any one intensity, they did differ in other aspects. Whereas the root mean square and peak values were theoretically equal for square waves, the rms values for sine waves were only 0.707 of the peak values. The rise times of the waveforms were also different, *i.e.*, the waveforms differed in the times required for the voltage or current to change from the maximum negative intensity to the maximum positive intensity, or from the maximum positive intensity to the maximum negative intensity. At all frequencies, the square-wave rise time was less than 0.15 microsecond. The rise time of the sine-wave, however, was a function of frequency, and varied from approximately 4.16 milliseconds at 60 Hz to approximately 0.26 millisecond at 960 Hz.

While both waveform and frequency affected the number of jumps, waveform and frequency had no interactive effect on jumping behavior. Indeed, at each frequency, there was a greater mean number of jumps per shock presentation under square-wave stimulation than under sine-wave stimulation. This suggests that, in spite of the earlier identification of rise time as the stimulating component of electric shock through attached electrodes (Helmholtz, 1851; Muenzinger & Walz, 1932), when an electrified grid floor is used, the stimulating component, although influenced by rise time, is more complex and varies with the behavioral responses being considered.

The behavioral effects of differences in frequency were limited to the shock-interval measures which indicated that the levels of performance varied directly with the frequency of the stimulating current. Because increasing the frequency affected the level of performance of the jump measures in a manner similar to that resulting from increased intensity, it might be concluded that the higher frequency stimulation was more intense. Although the positive relationship between frequency and phase shift (indicative of reduced power dissipation in the rat at the higher frequencies) casts doubt on this interpretation, it is probable that greater dissipation of power in the rat did occur at the higher frequencies at the same time that less power was being dissipated in the complete shock circuit. Although it is likely that there was greater dissipation of power in the rat, and, therefore, more intense stimulation at the higher frequencies, the increase would appear to have been small because no differences attributable to the differences in frequency were found in the freezing measures.

A factor which appears to contribute greatly to the stimulating component is the intensity of the stimulus, for as the intensity increased, so did the levels of performance of the behavioral responses. It is interesting to note that both increasing the frequency and increasing the root mean square value of the waveform by changing the waveform from sine to square had much the same effect as increasing the intensity itself.

The effects attributable to each of the four parameters of stimulation during response acquisition differed, in some cases, from those found during the retention tests. Frequency, as reported, produced no significant differences in the freezing or crossover measures during the retention tests (there being no shock presented during the retention tests, the shock-interval measures were not relevant). Intensity, however, had a continuing effect on the total-freezing during both retention tests. While it seems to have little effect on the response acquisition ulation during response acquisition differed, in some cases, from those found during the retention tests. Frequency, as reported, produced no significant differences in the freezing or crossover measures during the retention tests (there being no shock presented during the retention tests, the shock-interval measures were not relevant). Intensity, however, had a continuing effect on the total-freezing during both retention tests. Although it seem to have little effect on the response acquisition behavior, the mode of constancy had the most pervasive influence on the retention test behavior. This finding also suggests that there was some after-effect of shock which influenced the response acquisition measures.

Behavioral differences were also found to have resulted from the intervals of time between the response acquisition session and the retention tests. As might have been expected, the levels of performance generally declined from the first to the second retention test, although the decrease in freezing was reflected in the greater number of crossovers occurring during the second retention test.

The consistency of the effects of each of the parameters of shock studied suggests that behavior is modified in a predictable fashion as a function of the type of stimulation used, and it would further seem that each of the behavioral responses is dependent upon a different combination of the stimulus components. In this respect, it is possible to consider the level of performance of each of the responses as being described by a stimulus index which is likely a multiplicative function of the frequency, the intensity, the constancy factor, the number of shock presentations, the time elapsed after the response acquisition session, and of the reciprocal of the rise time. These stimulus indices may be

The consistency of the effects for each of the parameters of shock studied suggests that behavior is modified in a predictable fashion as a function of the type of stimulation used, and it would further seem that each of the behavioral responses is dependent upon a different combination of the stimulus components. In this respect, it is possible to consider the level of performance of each of the responses as being described by a stimulus index which is likely a multiplicative function of the frequency, the intensity, the mode of constancy, the number of shock presentations, the time elapsed after the response acquisition session, and of the reciprocal of the rise time. These stimulus indices may be conceptualized in the following manner:

for the jumping responses:

$$\Pi_j = f\left[\left(\frac{\nu\,\bar{A}}{\tau}\right)\left(\frac{1}{K+\Delta}\right)\left(\frac{N}{1+N^2/c}\right)\right]$$

for the freezing response:

$$\Pi_f = f\left[\left(\frac{\bar{A}}{\tau}\right)\left(\frac{K+\Delta}{1}\right)\left(\frac{1}{1+t}\right)\left(\frac{N}{1+N^2/c}\right)\right]$$

for the crossover response:

$$\Pi_c = f\left[\left(\frac{\bar{A}}{\tau}\right)\left(\frac{1}{K+\Delta}\right)\left(\frac{1+t}{1}\right)\right]$$

where:

Π - stimulus index

ν - frequency of alternation

$\bar{A}$ - an average of intensities at times of grid contact

τ - rise time of waveform

Δ - change in current density after instant of grid contact

t - time elapsed after stimulation

N - number of shock presentations

The term $\overline{A}$, representing an average of the intensities of stimulation at the times the rat contacts the grid bars, may appear to be a somewhat redundant term when the stimulation employed is constant current or constant voltage. Notwithstanding that current or voltage may be deemed constant when integrated over time, the current and voltage in an ac circuit vary instantaneously with alternation. For this reason, at the instant a rat makes contact with the grid electrodes, the intensity of stimulation might differ from the intensity which would have been experienced had the rat made contact with the grid electrodes at any other instant in time. As can be seen from Figure 39, an average of these intensities over a number of jumps would be greater under square-wave stimulation, where the maximum stimulus intensity is maintained from that time indicated by the numeral 2 to that time indicated by the numeral 4, and from that time indicated by the numeral 6 to that time indicated by the numeral 8 in any one cycle, than under sine-wave stimulation, where the maximum intensity is attained only at the times indicated by the numerals 3 and 7. Thus it would be predicted from the equations, that $\overline{A}$, an average of the intensities at each of the instants of contact, and therefore, Π, the stimulus index, would be greater under square-wave stimulation than under sine-wave stimulation. In a somewhat similar manner, the stimulus index would become greater as the intensity is increased.

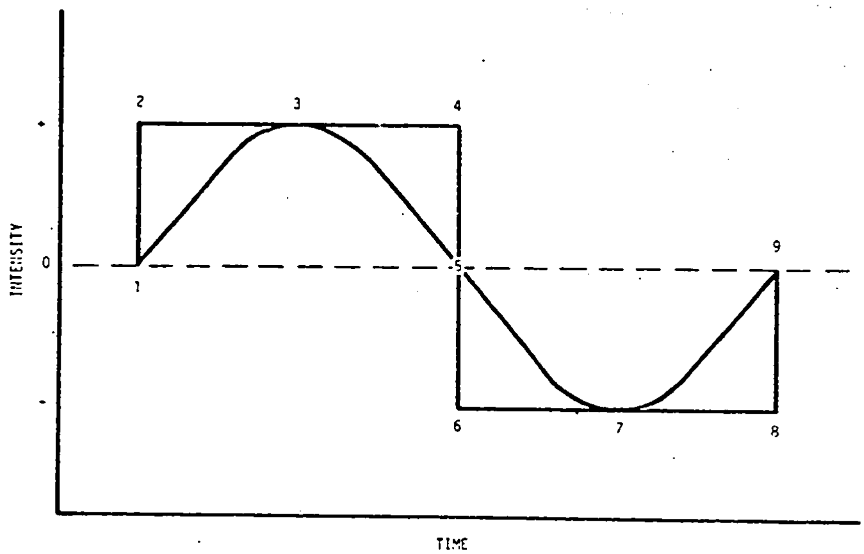


FIGURE 39. One cycle of a sine wave superimposed on a square wave of the same frequency and of the same peak voltage. The transitional points indicated by the numerals represent points on the time axis.

A greater stimulus index would also be predicted under square-wave stimulation because of the shorter rise time of the square wave, and the resulting larger reciprocal value of τ, the rise time. Similarly, for stimulation with waveforms other than square wave, which has a stable rise time over a large frequency range, the resulting stimulus index would increase with the frequency ν, because the rise time decreases as the frequency increases.

The effect of increasing numbers of shock presentations on the jumping responses has been discussed previously, and the term introduced at that time is included in the equation of the stimulus index for jumping responses. It is also included in the equation of the stimulus index for freezing responses since it was previously found (Hawkins, 1964) that the amount of freezing is an inverted U-shaped function of the number of shock presentations. Since the effect of the number of shock presentations on crossover activity is not known, the term is omitted from that stimulus index equation.

The changes in the retention test behavior which result from the passage of time are reflected in these equations by the inclusion of a time factor. In a similar manner, a constancy factor, which employs the amount of change in the current density which occurs after the rat has contacted the grid electrodes, causes the jump and crossover indices to be lower, and the freezing index to be greater, when constant current stimulation is used.

At this point, it is not clear what function the stimulus indices might be of the described factors, but it would appear that it is not linear. Not only would a linear function predict greater differences between stimulus conditions than did occur, but it would also prevent Π from reaching asymptotic values as suggested by the functions plotted in Figure 15. The fact that the rise time, as depicted in Figure 39 by the numerals 3 and 7 for sine wave, and by the numerals 4 and 6 for square wave, cannot be reduced to zero, and that the constancy factor by the inclusion of a constant value other than zero prevents Π from achieving an infinite value.

It is clear, however, to adequately account for the interactive effects of the parameters investigated, some of the terms in these equations will have to be modified. Nevertheless, it is interesting to note that with respect to the main effects, and with respect to at least the initial points of the interactive functions plotted in the various figures, these equations do tend to describe in ordinal fashion, the significant results obtained in this investigation. For example, the equation for the jump responses does describe the performance as a function of intensity as plotted in Figure 21. Similarly, with respect to Figure 34, the greater freezing occurring after constant current stimulation, and the decrease in freezing between the retention tests is described by the freez-response equation.

Because of the greater relative intensity of the constant current stimuli, the jump responses equation does not accurately reflect the findings of this study. The equation is, however, consistent with the current density hypothesis. As yet these equations do not predict the asymptotic levels of performance displayed at the higher intensities such as shown in Figures 6, 7, 8, and 15. It is anticipated than upon further empirical investigation and computer simulation, the relevant parameters and their interactions may be quantitatively described. The choice of shock source could then be made contingent upon the behavioral responses required in a given experimental situation.

It is now evident that the cirucit properties of the shock source used may determine, to a great extent, the behavioral responses in both the response acquisition and retention test sessions. The freezing response, which has heretofore been a confounding behavior (Brown & Jacobs, 1949; Hyatt, 1964; Miller, 1948; Robinson, 1963), having been shown to occur in a predictable fashion, need no longer be considered a confounding response. Its dependence upon reinforcement (reduction of noxious stimulus) and, therefore, its compliance with the empirical law of effect, its dependence upon the intensity of stimulation, and its eventual extinction after removal of the stimulation, indicate that in spite of earlier interpretations of freezing as innate behavior (Curti, 1935, 1942; Munn, 1950), the freezing response encountered in the grid electrode situation is learned. The resistance of freezing to extinction, which has been attributed to a learned fear drive, will allow the freezing response to be a valid and useful measure in the investigation of learned fear.

SUMMARY AND CONCLUSIONS

The effects of four parameters of electric shock stimulation (constancy of current or of voltage, waveform, intensity and frequency) and time after stimulation on the behavioral responses of rats were studied. Each *S* was confined for 5 min in one compartment of a modified Miller shuttle box, and subjected to nine 2-sec shocks. The *S*s were then immediately confined for 5 min in the second compartment. No shock was presented during this second period. The responses measured during the response acquisition period included the number and relative amplitude of the jumps occurring during the shock presentations, the phase shift of the stimulating waveforms during sine-wave stimulation, and the occurrence of freezing in the nonshock intervals. Eight days, and again 22 days after response acquisition, each *S* was placed in the shock compartment, but allowed free access to both compartments. No shock was presented during the retention tests. The responses measured during these retention tests included the occurrence of freezing, and the crossovers from one compartment to the other.

The major results and conclusions of this study were:

1. The method of phenomenological equivalence of intensities of constant current and constant voltage stimuli employed by Campbell and Teghtsoonian (1958) has inadvertently resulted in an inequality of constant current and constant voltage in-

tensities. It was suggested that the constant current aversion threshold be re-established using the freezing response as the significant behavioral referent.

2. The freezing response is learned under constant current stimulation, and is influenced by the waveform and intensity of stimulation. Frequency, over the range employed in this study, had no significant effect on freezing behavior.
3. Both the mean number of jumps per shock presentation, and the mean relative amplitude of jumps per shock presentation were influenced by each of the parameters of electric shock stimulation.
4. The acquisition process of the freezing response in a non-escapable situation was examined, and an explanation employing a number of theoretical concepts was offered.
5. Three equations encompassing six factors were presented as a means of describing in ordinal fashion, the main and interactive effects of the parameters relevant to jumping, freezing and crossover behavior.

Although it was suggested that the constant current aversion threshold be re-established, and the power of the equations be increased to allow interval scale predictions of the interactive effects of the dimensions of electric shock, it has been reliably demonstrated that the choice of shock source and level of intensity should be made contingent upon the behavioral responses chosen as the dependent behavior in a given experimental situation.

APPENDIX A

ELECTRONIC RECORDING OF SHUTTLE BOX ACTIVITY

J. T. HAWKINS and W. J. McCLELLAND

Paper read at the annual meeting of
the Canadian Psychological Association
May, 1967, Ottawa.

ELECTRONIC RECORDING OF SHUTTLE BOX ACTIVITY

There has been for the past few years, considerable research conducted in the area of avoidance and fear conditioning employing versions of the Miller-Mowrer shuttle box. The usual measures taken are the number of crossovers from one compartment to the other and the amount of time spent in each compartment. With the original Miller-Mowrer cage, the detection of the crossover from the shock compartment to the *safe* compartment was relatively easy because a guillotine door dropped.

The use of such a door appears to have been abandoned, in most instances, in favour of a low hurdle or archway allowing free access to both compartments. With these modifications, the measurement of the direction of movement and the length of stay in each compartment proved difficult to automate reliably.

Perhaps the earliest form of automation was the advent of the tilt cage in which the movement of the rat over the central axis caused the cage to tilt and thereby activate a microswitch or mercury switch. The early form of mercury switch, essentially a pin which dipped into a pool of mercury as the cage tilted, often sparked resulting in spuriously high crossover counts. The use of the microswitch solves this problem, but still requires the cage to tilt. This tilting results in undesirable kinesthetic cues and requires a delicate balancing of the cage. To maintain reliable operation with rats of differing weights, some means of weight compensation such as variable tension springs (Valenstein & Myers, 1964) should be included.

Photoresistors eliminate the kinesthetic cues but may introduce visual and heat cues due to the relatively high intensity of the excitor bulbs necessary to prevent false triggering by ambient or reflected light. Because of the pulse nature of the photoresistor triggering, a barrier may be necessary, as pointed out by Fallon (1966), to reduce the rat's speed while crossing from one compartment to the other to ensure reliable operation of the relays.

A system incorporating two electronic contact sensors (Drinkometers) and a two-coil latching relay has been devised which can be connected to any grid floor without modification of the cage. This system was integrated with a number of other stimulus and monitor systems. SLIDE 1 is a block diagram of the functional connections of these units.

At the top of the diagram is the program or control system made up of the usual collection of relays, timers, and tape programmers. This programmer controls, as indicated by the arrows, the oscilloscope camera photographing the shock wave forms, the onset and duration of the shock, the operation of the grid shock scrambler, and the shock-record switching centre which connects the cage either to the shock systems shown on the left of the switching centre, or to the monitoring systems shown on the right. At the top right is the capacitance sensing motion detector introduced by Dr. McClelland at the 1965 meeting in Vancouver. This is used to monitor the activity of the rat in the cage, and allows the graphic recording of freezing, rearing, and ambulatory behavior.

Immediately below the motion detector is the spatial preference detection system shown here as Drinkometer 1 and Drinkometer 2. This side detection system is composed of two drinkometers and an assortment of relays as shown in SLIDE 2.

Sensing lead D from the first drinkometer and sensing lead E from the second drinkometer are connected in common through a relay switching centre (relays A, B & C) to all the odd-numbered grids and to grids 20 and 22 on either side of the centreline of the cage. The second sensing lead C from drinkometer 1 is connected, through the relay switching centre, to the even-numbered grids (2 to 18) of the black compartment. Similarly, the second sensing lead F from drinkometer 2 is connected through the relay switching centre to the even-numbered grids (24 to 40) of the white compartment. When *S* contacts an odd-numbered grid and an even-numbered grid (excluding grids 20 and 22) in one compartment, it establishes a conductive path that completes the drinkometer input circuit causing the drinkometer relay and the interlocking control relays D, E and F to operate. When the rat crosses from one compartment to the other, the sensing system causes the time of the crossover to be printed by a Sodeco print-out counter. Similarly, when the rat recrosses the centreline, the time of that crossover is also recorded.

The use of a two-coil latching relay (relay F) allows a crossover to be defined in electromechanical terms, that is the print-out counter prints or does not print. When the rat is in the black compartment (shown as grids 1 to 19 in the diagram), any contact between an odd-numbered and an even-numbered grid causes the relay of Drinkometer 1 to be actuated, which in turn causes relay E to be actuated, which in its turn allows a flow of current in the right-hand coil of relay F.

When the rat starts to cross over to the white compartment (grids 23 to 40), an odd-even grid contact causes the drinkometer 2 relay to be actuated, in turn causing relay D to operate. The printer does not print, however, because the simultaneous energizing of relays D and E breaks the circuit to relay F which does not change state because of the mechanical latch. At this point the rat is making contact in both compartments.

Should the rat not complete the crossover but return to the black compartment, relay E is again actuated allowing the current to flow in the right hand coil of relay F. Since this relay was previously latched in that position, it does not change state and no print command is issued.

However, should the rat complete the crossover, relay E is de-energized while relay D remains energized. Current is thus allowed to flow through the left hand coil of relay F causing it to change state and issue a print command.

Because the interlocking system (relays D, E and F) requires the rat to break contact with the sensing circuit in the one compartment and to complete the circuit in the compartment it is entering to cause a crossover to be recorded, jumping and incomplete crossings are not recorded.

A crossover has traditionally been recorded when approximately half of the body length of the rat was in the second compartment. So that the electromechanical definition might parallel the traditional one, a neutral zone, extending for 1 $^{7}/_{16}$ in on each side of the central partition, was created by wiring grids 20 and 22 in parallel with the odd-numbered grids. Because of this neutral zone, it is necessary that somewhat more than half of the rat's body length be in the second compartment before a crossover is recorded.

As indicated in the diagram of functional connections, this side detection system operates simultaneously with the capacitance sensing motion detector, and shares the same digital print-out system. The use of a servo-recorder in the motion detection system allows freezing or immobility to be recorded not only in graph form but also in digital form, that is, freezing is or is not occurring. In a servo-recorder, there is no voltage at the pen motor when freezing occurs. A Schmitt trigger connected to the pen motor detects the presence or absence of voltage and thus gives a digital indication of the occurrence and duration of freezing.

Because there is a 5-sec time requirement in our definition of freezing, a timer at the output of the Schmitt trigger causes the recording of the occurrence to be delayed for five seconds. When the rat first moves again, the time of such occurrence is also recorded.

We now have a situation in which the rat can be in one of four exclusive conditions. SLIDE 3 will illustrate this. The rat is placed in the black compartment at time zero and is considered, by definition, to be moving, giving rise to the first entry in the columns below. The 2 indicates movement in the black compartment. The zeros indicate time zero in minutes, seconds and tenths of seconds. The rat can now do only one of three things. First, it can keep moving in the black compartment. In this case no further record is made. There are two other courses of action open to the rat as implied by the arrows extending from the second box to the first and to the third. The rat could cross to the white compartment or freeze in the black compartment. The rat in this particular example froze in the black compartment 1.2 sec after being placed in the cage, giving rise to the second entry which, incorporates the 5-sec time criterion and is printed as behavior code 1 occurring at 6.2 seconds. The 5 seconds lost in this operation are replaced during the computer calculations. Now the rat has only one course of action as indicated by the block diagram. The next response, if there is one, must be movement in the black compartment, shown here as *2-01-15-7*. Movement to the white compartment results in the coded score *3-01-54-9* being printed. The last score on the list is not a behavior score, but is a time score. The zero is the computer code indicating the last entry for this rat, and the *-20-00-0* indicates the end of the 20-min test period.

The final slide (SLIDE 4) shows the list of scores shown in the previous slide superimposed on the computer summary of these data. As mentioned earlier, adjustment is made by the computer program for the freezing definition time loss. The individual times spent in each behavior are calculated, summed, and a mean calculated. The number of times each behavior occurs is calculated as are the various combinations of scores.

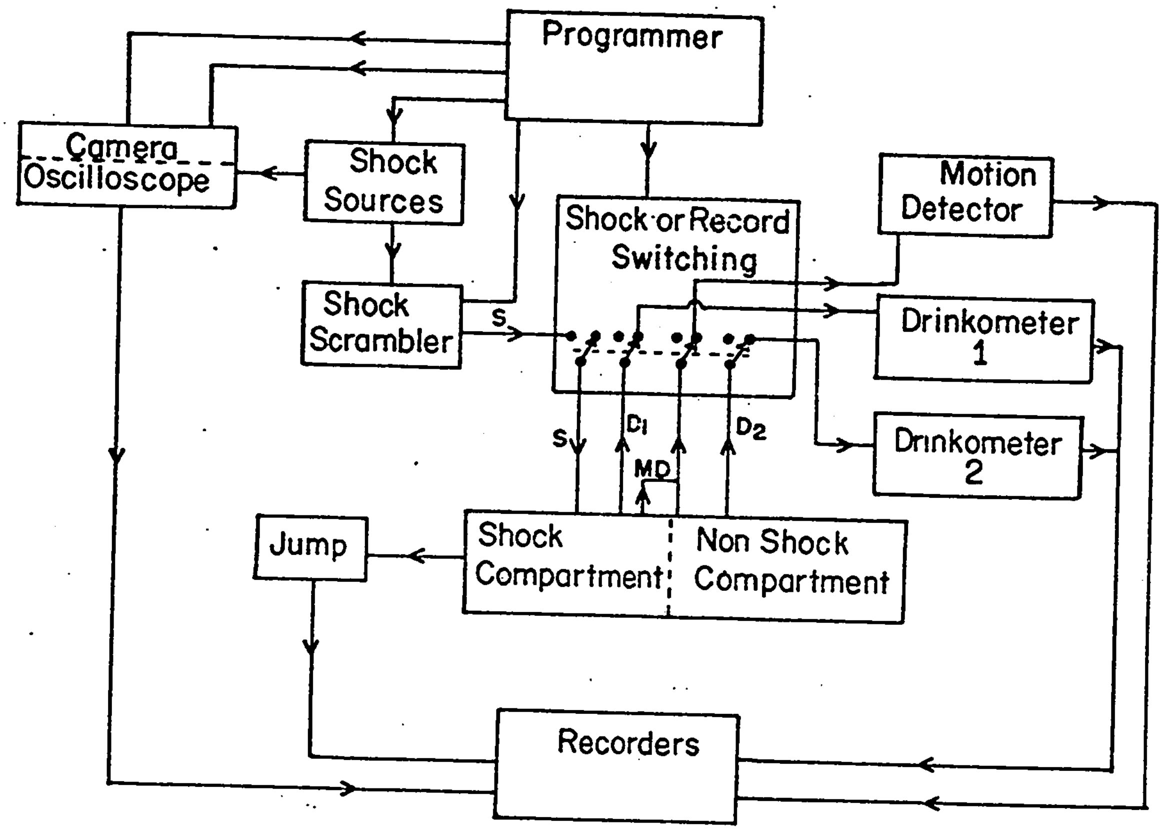
By replacing the electromechanical components with transistorized logic modules, the data acquisition system becomes computer compatible. It is at this stage that we are at the present time. Our department [at the University of Western Ontario] has recently acquired a Digital PDP 8/S computer, and we hope to combine the objectivity of our measuring system with the speed of the computer.

We have also been recording jumping activity (including violent movements such as occur in convulsions). The measurement of these responses is still a manual operation. We hope soon to make this system computer compatible too, thus allowing us to monitor, record, and analyze virtually all of the physical activity in the shuttle box.

REFERENCES

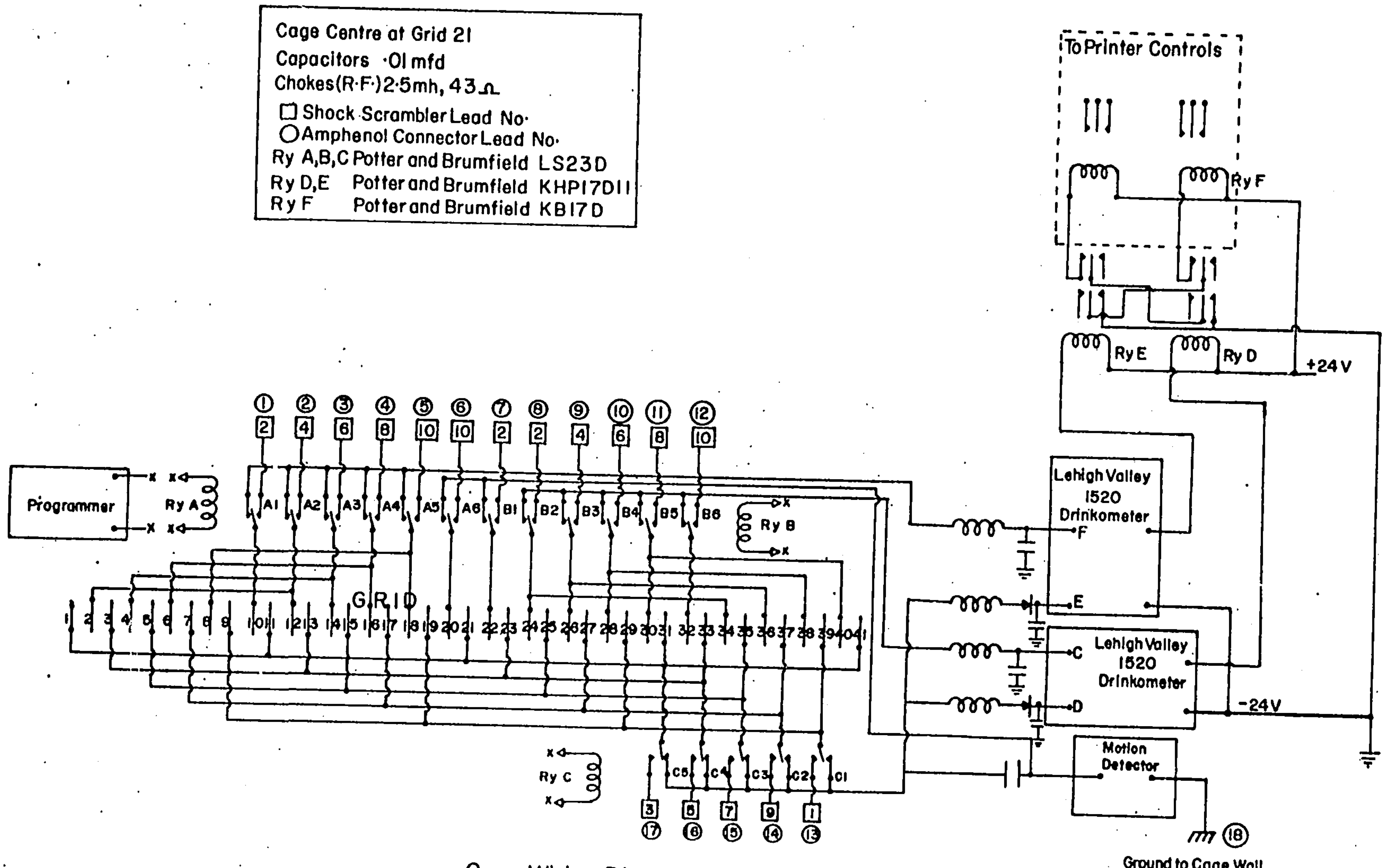
Fallon, L. A "direction of movement" memory. *Journal of the Experimental Analysis of Behavior*, 1966, 9, 514.

Valenstein, E. S. and Myers, W. J. Rate-independent test of reinforcing consequences of brain stimulation. *Journal of Comparative and Physiological Psychology*, 1964, 57, 452-460.



Block Diagram of the Functional Connections of Units

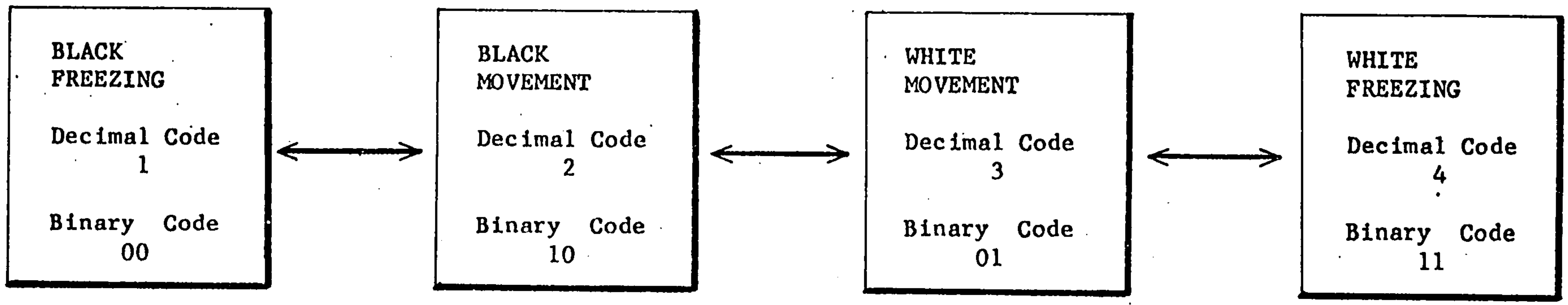
SLIDE 1



Cage Wiring Diagram

J·T·Hawkins,1966·

SLIDE 2



CODE	MINUTES	SECONDS	1/10 SECONDS
2	00	00	0
1	00	06	2
2	01	15	7
3	01	54	9
2	03	27	6
3	06	57	7
4	07	27	0
0	20	00	0

SLIDE 3

	BLACK MOVEMENT	BLACK FREEZING	WHITE MOVEMENT	WHITE FREEZING
	1.2	74.5	92.7	758.0
	39.2	0.0	24.3	0.0
	210.1	0.0	0.0	0.0
TOTAL	250.5	74.5	117.0	758.0
NO.	3	1	2	1
MEAN	83.5	74.5	58.5	758.0

TOTAL BLACK TIME	325.0	CROSSES TO BLACK	1	BL. FR. RATIO	22.9 PERCENT
TOTAL WHITE TIME	875.0	CROSSES TO WHITE	2	WH. FR. RATIO	86.6 PERCENT
TOTAL FREEZING	832.5	TOTAL CROSSES	3	TIME CHECK	1200.0 SECONDS

200000
100062
201157
301549
203276
306577
407270
020000

SLIDE 4

APPENDIX B

CONSTANT CURRENT/CONSTANT VOLTAGE SHOCK SOURCE

CONSTANT CURRENT/CONSTANT VOLTAGE SHOCK SOURCE

The shock source designed and constructed for this study provides either constant current or constant voltage stimulation, the mode of constancy being selected by a front-panel switch. In this study, the output of a Heath IG-82 sine-square wave generator was amplified to provide the shock stimulus. The relatively large coupling capacitors, and the large output capacitor serve to black any dc component from the output, and in addition, allow a broad band amplification.

In the constant voltage mode, V_3, a cathode follower which is, in effect, an impedance transformer, is connected in the circuit, providing a low impedance output. In the constant current mode, V_3 is disconnected from the circuit, resulting in a high impedance output.

The preset adjustments allow the degree of amplification to be preset. The output, therefore, can be made some multiple of the input, allowing the output to be monitored, in effect, by measuring the input values.

CONSTANT VOLTAGE

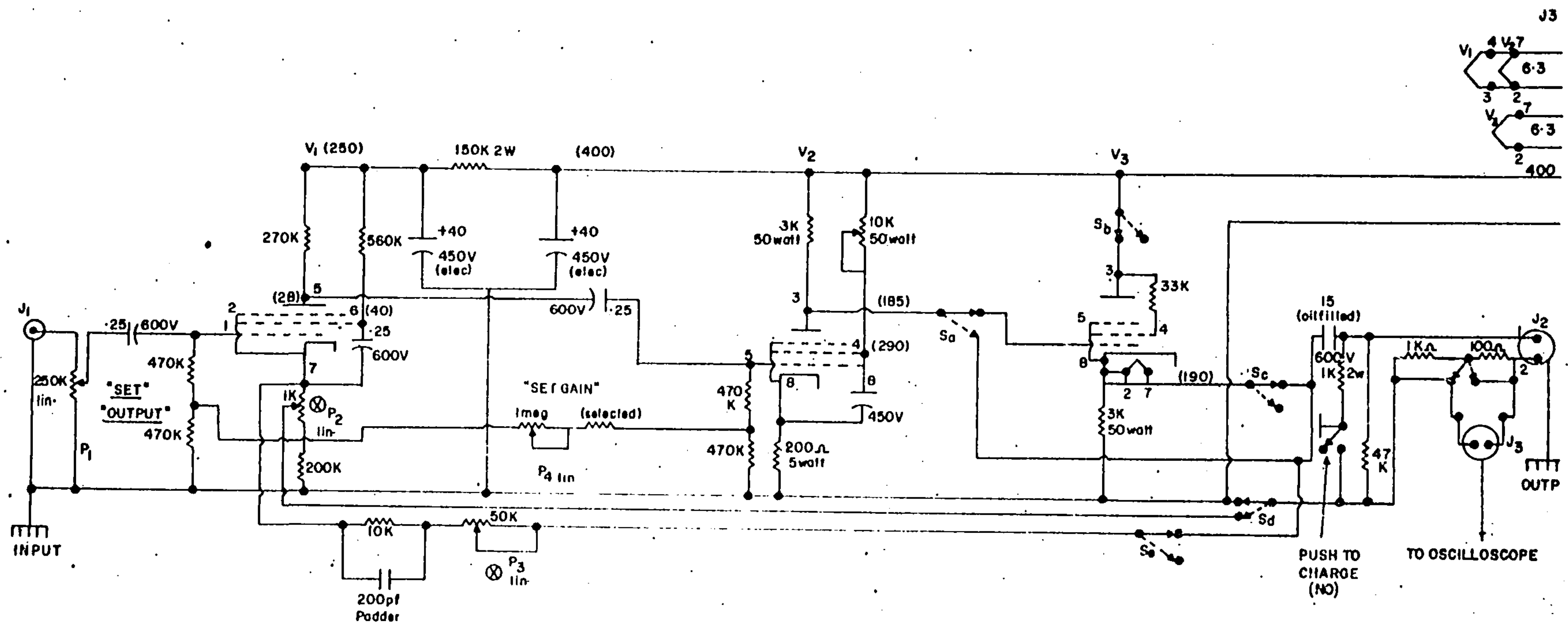
Frequency Response - ±0.5 db, 20 - 100,000 Hz into 5KΩ load

Maximum Output Voltage - 80 V rms, sine wave into 5KΩ load
200 V p-p, square wave into 5KΩ load

CONSTANT CURRENT

Current Regulation Range 0 - 10 ma

Minimum Load 5KΩ

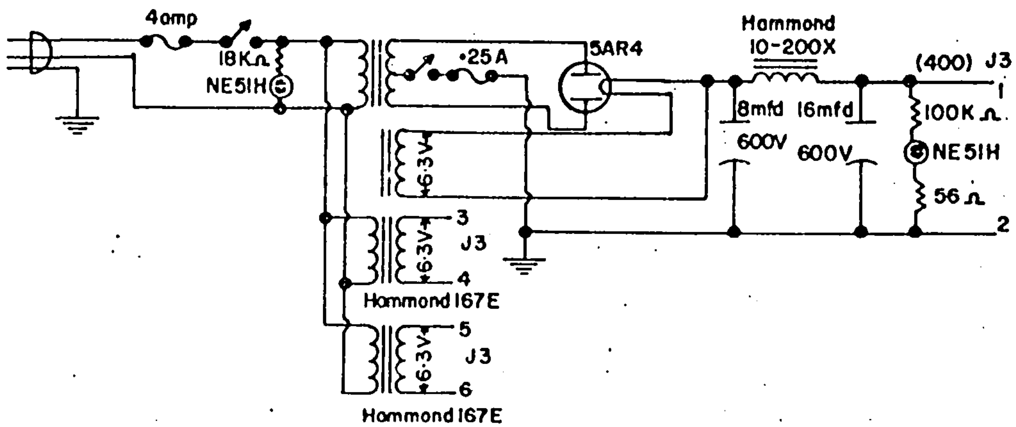


V_1-6AU6, V_2V_3-KT77; ⊗ Preset Adjustments; Switch Shown in "Constant Voltage" Position-Static DC Voltages in Brackets; All Capacitors (in microfarads), less than one μfd are shielded Types (metal cans) Aerovox P3235 or equivalent

Shock Amplifier

W·J·Sarjeant, 1965·

FIGURE 1



Shock Amplifier Power Supply
(Static DC Voltage in Brackets)

W·J·Sarjeant, 1965·

FIGURE 2

APPENDIX C

Response acquisition and retention test measures:

Duration of movement in black compartment,
Duration of freezing in black compartment,
Duration of movement in white compartment,
Duration of freezing in white compartment,
Number of occurrences of movement in black compartment,
Number of occurrences of freezing in black compartment,
Number of occurrences of movement in white compartment,
Number of occurrences of freezing in white compartment,
Duration of total-freezing
Mean duration of movement in black compartment,
Mean duration of freezing in black compartment,
Mean duration of movement in white compartment, and
Mean duration of freezing in white compartment.

Response acquisition only measures:

Number of jumps per quarter, half, and whole shock presentation,
Relative amplitude of jumps per quarter, half, and whole shock presentation, and
Phase shift during sine-wave shock presentations.

Retention test only measures:

Time spent in black compartment,
Time spent in white compartment,
Crosses to white compartment,
Crosses to black compartment,
Total crossovers,
Percentage-freezing in black compartment (Black Fr. Ratio), and
Percentage-freezing in white compartment (White Fr. Ratio).

APPENDIX D

Summaries of the levels of significance achieved by the main effects and interactions of all analyses of variance.

TABLE 1. SUMMARY OF SIGNIFICANCE LEVELS OF ANALYSES OF VARIANCE OF RESPONSE ACQUISITION NONSHOCK INTERVAL MEASURES

	BLACK MOVEMENT	BLACK FREEZING	WHITE MOVEMENT	WHITE FREEZING	NO. BL. MOVEMENT	NO. BL. FREEZING	NO. WH. MOVEMENT	NO. WH. FREEZING	TOTAL FREEZING	MEAN BL. MOVEMENT	MEAN BL. FREEZING	MEAN WH. MOVEMENT	MEAN WH. FREEZING
CONSTANCY (A)	--	--	$p<.05$	$p<.05$	--	--	--	--	--	--	--	--	--
WAVEFORM (B)	$p<.01$	$p<.01$	$p<.01$	$p<.01$	$p<.05$	$p<.05$	$p<.05$	$p<.05$	$p<.01$	$p<.01$	$p<.01$	--	$p<.01$
INTENSITY (C)	$p<.05$	$p<.05$	$p<.05$	$p<.05$	$p<.01$	$p<.01$	--	--	$p<.01$	$p<.01$	--	$p<.01$	--
FREQUENCY (D)	--	--	--	--	$p<.05$	$p<.05$	--	--	--	--	--	--	--
A x B	$p<.05$	$p<.05$	$p<.01$	$p<.01$	$p<.01$	$p<.01$	--	--	$p<.01$	$p<.01$	--	$p<.05$	--
A x C	--	--	$p<.01$	$p<.01$	--	--	--	--	--	--	--	--	--
A x D	--	--	--	--	--	--	--	--	--	--	--	--	--
B x C	$p<.05$	$p<.05$	$p<.05$	$p<.05$	--	--	--	--	$p<.05$	--	$p<.05$	--	--
B x D	--	--	--	--	--	--	--	--	--	--	$p<.05$	--	--
C x D	--	--	--	--	--	--	--	--	--	--	--	$p<.05$	--
A x B x C	$p<.01$	$p<.01$	--	--	$p<.05$	$p<.05$	--	--	$p<.01$	$p<.01$	--	--	--
A x B x D	$p<.05$	$p<.05$	--	--	--	--	$p<.05$	--	$p<.05$	--	--	--	--
A x C x D	--	--	--	--	--	--	--	$p<.05$	--	--	--	--	$p<.01$
B x C x D	--	--	--	--	$p<.05$	$p<.05$	--	--	--	$p<.05$	--	--	--
A x B x C x D	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 2. SUMMARY OF SIGNIFICANCE LEVELS OF ANALYSES OF VARIANCE OF RESPONSE ACQUISITION NONSHOCK INTERVAL MEASURES (COLLAPSED OVER FREQUENCY)

	BLACK MOVEMENT	BLACK FREEZING	WHITE MOVEMENT	WHITE FREEZING	NO. BL. MOVEMENT	NO. BL. FREEZING	NO. WH. MOVEMENT	NO. WH. FREEZING	TOTAL FREEZING	MEAN BL. MOVEMENT	MEAN BL. FREEZING	MEAN WH. MOVEMENT	MEAN WH. FREEZING
CONSTANCY (A)	--	--	$p<.05$	$p<.05$	--	--	--	--	--	--	--	--	--
WAVEFORM (B)	$p<.01$	$p<.01$	$p<.01$	$p<.01$	$p<.05$	$p<.05$	$p<.05$	$p<.05$	$p<.01$	$p<.01$	$p<.01$	--	$p<.01$
INTENSITY (C)	--	--	$p<.05$	$p<.05$	$p<.01$	$p<.01$	--	--	$p<.01$	$p<.01$	--	$p<.01$	--
A x B	$p<.05$	$p<.05$	$p<.01$	$p<.01$	$p<.01$	$p<.01$	--	--	$p<.01$	$p<.01$	--	$p<.05$	--
A x C	--	--	$p<.01$	$p<.05$	--	--	--	--	--	--	--	--	--
B x C	$p<.05$	$p<.05$	$p<.05$	$p<.05$	--	--	--	--	$p<.05$	--	$p<.05$	--	--
A x B x C	$p<.01$	$p<.01$	--	--	$p<.05$	$p<.05$	--	--	$p<.01$	$p<.01$	--	--	--

TABLE 3. SUMMARY OF SIGNIFICANCE LEVELS OF ANALYSES OF VARIANCE OF JUMP MEASURES

	AMPLITUDE BY QUARTER	AMPLITUDE BY HALF	AMPLITUDE BY WHOLE	NUMBER BY QUARTER	NUMBER BY HALF	NUMBER BY WHOLE
CONSTANCY (A)	$p<.01$	$p<.01$	$p<.01$	$p<.01$	$p<.01$	$p<.01$
WAVEFORM (B)	--	--	--	$p<.05$	$p<.05$	$p<.05$
INTENSITY (C)	$p<.01$	$p<.01$	$p<.01$	$p<.01$	$p<.01$	$p<.01$
FREQUENCY (D)	$p<.01$	$p<.01$	$p<.01$	$p<.01$	$p<.01$	$p<.01$
A x B	--	--	--	--	--	--
A x C	$p<.01$	$p<.01$	$p<.01$	$p<.01$	$p<.01$	$p<.01$
A x D	--	--	--	--	--	--
B x C	--	$p<.05$	$p<.01$	--	--	--
B x D	--	--	--	--	--	--
C x D	$p<.05$	$p<.01$	$p<.01$	--	--	--
A x B x C	--	--	--	--	--	--
A x B x D	--	--	--	--	--	--
A x C x D	--	--	--	--	--	--
B x C x D	--	--	--	--	--	--
A x B x C x D	--	--	--	--	--	--
TIME (E)	$p<.01$	$p<.01$	$p<.01$	$p<.01$	$p<.01$	$p<.01$
A x E	$p<.01$	$p<.01$	--	$p<.01$	$p<.01$	$p<.01$
B x E	--	--	--	$p<.05$	$p<.05$	--
C x E	$p<.01$	$p<.01$	$p<.01$	$p<.01$	$p<.01$	$p<.01$
D x E	--	--	--	--	--	--
A x B x E	$p<.05$	$p<.01$	--	$p<.01$	$p<.01$	--
A x C x E	$p<.01$	$p<.01$	$p<.05$	$p<.01$	$p<.05$	$p<.01$
A x D x E	$p<.05$	--	--	--	--	--
B x C x E	$p<.01$	--	--	$p<.01$	$p<.01$	--
B x D x E	--	--	--	--	--	--
C x D x E	--	--	--	--	--	--
A x B x C x E	--	--	--	--	--	--
A x B x D x E	--	--	--	--	--	--
A x C x D x E	--	--	--	--	--	--
B x C x D x E	--	--	--	--	--	--
A x B x C x D x E	--	--	--	--	--	--

TABLE 4. SUMMARY OF SIGNIFICANCE LEVELS OF ANALYSIS OF VARIANCE OF SINE-WAVE PHASE SHIFT MEASURES

CONSTANCY (A)	$p<.01$
INTENSITY (C)	$p<.01$
FREQUENCY (D)	$p<.01$
A x C	$p<.05$
A x D	--
C x D	--
A x C x D	$p<.01$
FRAME (E)	$p<.01$
A x E	--
C x E	--
D x E	--
A x C x E	$p<.05$
A x D x E	$p<.05$
C x D x E	--
A x C x D x E	--

TABLE 5. SUMMARY OF SIGNIFICANCE LEVELS OF ANALYSES OF VARIANCE OF RETENTION TEST ONE MEASURES

	BLACK MOVEMENT	BLACK FREEZING	WHITE MOVEMENT	WHITE FREEZING	NO. BL. MOVEMENT	NO. BL. FREEZING	NO. WH. MOVEMENT	NO. WH. FREEZING	TOTAL FREEZING	MEAN BL. MOVEMENT	MEAN BL. FREEZING	MEAN WH. MOVEMENT	MEAN WH. FREEZING	TOTAL BL. TIME	TOTAL WH. TIME	CROSSES TO BL.	CROSSES TO WH.	TOTAL CROSSES	BLACK FR. RATIO	WHITE FR. RATIO
CONSTANCY (A)	p<.01	--	p<.01	p<.01	p<.01	--	--	p<.05	p<.01	p<.01	p<.05	p<.01	--	--	--	p<.01	p<.01	p<.01	p<.01	p<.01
WAVEFORM (B)	p<.01	--	--	--	--	--	--	--	p<.01	--	--	--	--	--	--	--	--	--	--	--
INTENSITY (C)	p<.01	--	--	p<.05	p<.05	--	--	--	p<.01	p<.05	--	--	p<.05	--	--	p<.01	p<.01	p<.01	--	--
FREQUENCY (D)	p<.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
A x B	p<.01	--	--	--	--	--	--	--	p<.01	p<.01	--	p<.05	--	--	--	p<.05	p<.05	p<.05	p<.01	--
A x C	--	--	--	--	--	--	--	--	--	--	--	--	p<.05	--	--	--	--	--	--	--
A x D	--	--	p<.05	--	--	--	--	--	--	p<.05	--	--	--	--	--	--	--	--	--	--
B x C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B x D	--	--	p<.05	--	p<.01	p<.01	p<.05	p<.05	--	--	--	--	--	p<.05	p<.05	--	--	--	--	--
C x D	--	--	--	--	--	--	--	--	--	p<.01	--	--	--	--	--	--	--	--	--	--
A x B x C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	p<.01	p<.01	p<.01	--	--
A x B x D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
A x C x D	--	p<.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	p<.05	--
B x C x D	--	--	--	--	--	--	--	--	--	--	--	p<.05	--	--	--	--	--	--	--	--
A x B x C x D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 6. SUMMARY OF SIGNIFICANCE LEVELS OF ANALYSES OF VARIANCE OF RETENTION TEST ONE MEASURES (COLLAPSED OVER FREQUENCY)

	BLACK MOVEMENT	BLACK FREEZING	WHITE MOVEMENT	WHITE FREEZING	NO. BL. MOVEMENT	NO. BL. FREEZING	NO. WH. MOVEMENT	NO. WH. FREEZING	TOTAL FREEZING	MEAN BL. MOVEMENT	MEAN BL. FREEZING	MEAN WH. MOVEMENT	MEAN WH. FREEZING	TOTAL BL. TIME	TOTAL WH. TIME	CROSSES TO BL.	CROSSES TO WH.	TOTAL CROSSES	BLACK FR. RATIO	WHITE FR. RATIO
CONSTANCY (A)	p<.01	--	p<.01	p<.01	p<.01	--	--	p<.05	p<.01	p<.01	p<.05	p<.01	--	--	--	p<.01	p<.01	p<.01	p<.01	p<.01
WAVEFORM (B)	p<.01	--	--	--	--	--	--	--	p<.05	--	--	--	--	--	--	--	--	--	--	--
INTENSITY (C)	p<.01	--	--	p<.05	p<.05	--	--	--	p<.01	p<.05	--	--	p<.05	--	--	p<.01	p<.01	p<.01	--	--
A x B	p<.01	--	--	--	--	--	--	--	p<.01	p<.01	--	p<.05	--	--	--	p<.05	p<.05	p<.05	p<.01	--
A x C	--	--	--	--	--	--	--	--	--	--	--	--	p<.05	--	--	--	--	--	--	--
B x C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
A x B x C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	p<.01	p<.01	p<.01	--	--

TABLE 7. SUMMARY OF SIGNIFICANCE LEVELS OF ANALYSES OF VARIANCE OF RETENTION TEST TWO MEASURES

	BLACK MOVEMENT	BLACK FREEZING	WHITE MOVEMENT	WHITE FREEZING	NO. BL. MOVEMENT	NO. BL. FREEZING	NO. WH. MOVEMENT	NO. WH. FREEZING	TOTAL FREEZING	MEAN BL. MOVEMENT	MEAN BL. FREEZING	MEAN WH. MOVEMENT	MEAN WH. FREEZING	TOTAL BL. TIME	TOTAL WH. TIME	CROSSES TO BL.	CROSSES TO WH.	TOTAL CROSSES	BLACK FR. RATIO	WHITE FR. RATIO
CONSTANCY (A)	$p<.01$	--	--	$p<.01$	$p<.01$	$p<.05$	--	--	$p<.01$	$p<.05$	--	--	$p<.05$	$p<.05$	$p<.05$	$p<.01$	$p<.01$	$p<.01$	--	$p<.01$
WAVEFORM (B)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
INTENSITY (C)	--	--	--	--	--	--	--	--	$p<.05$	--	--	$p<.01$	--	--	--	$p<.05$	$p<.05$	$p<.05$	--	--
FREQUENCY (D)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
A x B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
A x C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	$p<.01$	--
A x D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B x C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B x D	--	$p<.05$	$p<.05$	--	--	--	--	--	--	--	--	--	--	--	$p<.05$	--	--	--	--	--
C x D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
A x B x C	--	--	$p<.05$	$p<.05$	--	--	--	--	$p<.05$	--	--	$p<.01$	--	--	--	$p<.05$	--	--	--	$p<.05$
A x B x D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	$p<.05$	$p<.05$	$p<.05$	--	--
A x C x D	--	--	--	$p<.05$	--	--	--	--	--	--	--	--	--	--	--	--	--	--	$p<.05$	--
B x C x D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
A x B x C x D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	$p<.05$	$p<.05$	$p<.05$	--	$p<.05$

TABLE 8. SUMMARY OF SIGNIFICANCE LEVELS OF ANALYSES OF VARIANCE OF RETENTION TEST TWO MEASURES (COLLAPSED OVER FREQUENCY)

	BLACK MOVEMENT	BLACK FREEZING	WHITE MOVEMENT	WHITE FREEZING	NO. BL. MOVEMENT	NO. BL. FREEZING	NO. WH. MOVEMENT	NO. WH. FREEZING	TOTAL FREEZING	MEAN BL. MOVEMENT	MEAN BL. FREEZING	MEAN WH. MOVEMENT	MEAN WH. FREEZING	TOTAL BL. TIME	TOTAL WH. TIME	CROSSES TO BL.	CROSSES TO WH.	TOTAL CROSSES	BLACK FR. RATIO	WHITE FR. RATIO
CONSTANCY (A)	$p<.01$	--	--	$p<.01$	$p<.01$	$p<.05$	--	--	$p<.01$	$p<.05$	--	--	$p<.05$	$p<.05$	$p<.05$	$p<.01$	$p<.01$	$p<.01$	--	$p<.01$
WAVEFORM (B)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
INTENSITY (C)	--	--	--	--	--	--	--	--	$p<.05$	--	--	$p<.01$	--	--	--	$p<.05$	--	$p<.05$	--	--
A x B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
A x C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	$p<.01$	--
B x C	--	--	--	--	--	--	--	--	--	--	--	--	--	$p<.05$	--	--	--	--	--	--
A x B x C	--	--	$p<.05$	$p<.05$	--	--	--	--	$p<.05$	--	--	$p<.01$	--	--	--	--	--	--	--	$p<.05$

TABLE 9. SUMMARY OF SIGNIFICANCE LEVELS OF ANALYSES OF VARIANCE OF INTER-RETENTION TEST MEASURES

	BLACK MOVEMENT	BLACK FREEZING	WHITE MOVEMENT	WHITE FREEZING	NO. BL. MOVEMENT	NO. BL. FREEZING	NO. WH. MOVEMENT	NO. WH. FREEZING	TOTAL FREEZING	MEAN BL. MOVEMENT	MEAN BL. FREEZING	MEAN WH. MOVEMENT	MEAN WH. FREEZING	TOTAL BL. TIME	TOTAL WH. TIME	CROSSES TO BL.	CROSSES TO WH.	TOTAL CROSSES	BLACK FR. RATIO	WHITE FR. RATIO
CONSTANCY (A)	$p<.01$	--	--	$p<.01$	$p<.01$	--	--	$p<.05$	$p<.01$	$p<.01$	$p<.01$	$p<.05$	--	--	--	$p<.01$	$p<.01$	$p<.01$	$p<.01$	$p<.01$
WAVEFORM (B)	--	--	--	--	$p<.05$	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
INTENSITY (C)	--	--	--	$p<.05$	--	--	--	--	$p<.01$	--	--	--	--	--	--	$p<.01$	$p<.01$	$p<.01$	--	--
FREQUENCY (D)	$p<.05$	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
A x B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
A x C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
A x D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B x C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B x D	--	$p<.01$	$p<.01$	--	$p<.05$	$p<.01$	$p<.05$	$p<.05$	--	--	--	--	--	$p<.01$	$p<.01$	--	--	--	--	--
C x D	--	--	--	--	--	--	--	--	--	$p<.05$	--	--	--	--	--	--	--	--	--	--
A x B x C	--	--	--	--	$p<.05$	--	--	--	--	--	--	--	--	--	--	$p<.01$	$p<.01$	--	--	--
A x B x D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	$p<.05$	$p<.05$	$p<.05$	--	--
A x C x D	--	$p<.05$	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B x C x D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	$p<.01$	--
A x B x C x D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TIME E	$p<.01$	$p<.01$	$p<.01$	--	$p<.01$	$p<.05$	$p<.01$	$p<.01$	$p<.01$	--	$p<.01$	--	$p<.01$	--	--	$p<.05$	$p<.05$	$p<.05$	$p<.01$	$p<.05$
A x E	--	--	--	--	--	--	--	--	$p<.05$	--	--	$p<.01$	--	--	--	--	--	--	--	--
B x E	$p<.05$	--	--	--	--	--	--	--	$p<.01$	$p<.05$	--	--	--	--	--	--	--	--	--	--
C x E	$p<.05$	--	--	--	--	--	--	$p<.05$	--	$p<.05$	--	--	$p<.05$	--	--	--	--	--	--	--
D x E	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
A x B x E	$p<.05$	$p<.01$	--	--	--	$p<.05$	--	--	$p<.01$	$p<.01$	--	$p<.05$	--	--	--	$p<.05$	$p<.05$	$p<.05$	$p<.01$	--
A x C x E	--	--	--	--	--	$p<.05$	--	--	--	--	--	--	--	$p<.05$	--	--	--	--	--	--
A x D x E	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B x C x E	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B x D x E	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	$p<.05$	$p<.05$	$p<.05$	--	--
C x D x E	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	$p<.05$	$p<.05$	$p<.05$	--	--
A x B x C x E	--	--	$p<.05$	--	--	--	--	--	$p<.05$	--	--	--	--	--	--	--	--	--	--	--
A x B x D x E	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
A x C x D x E	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B x C x D x E	--	--	--	--	--	--	--	--	--	--	--	$p<.05$	--	--	--	--	--	--	--	--
A x B x C x D x E	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 10. SUMMARY OF SIGNIFICANCE LEVELS OF ANALYSES OF VARIANCE OF INTER-RETENTION TEST MEASURES (COLLAPSED OVER FREQUENCY)

	BLACK MOVEMENT	BLACK FREEZING	WHITE MOVEMENT	WHITE FREEZING	NO. BL. MOVEMENT	NO. BL. FREEZING	NO. WH. MOVEMENT	NO. WH. FREEZING	TOTAL FREEZING	MEAN BL. MOVEMENT	MEAN BL. FREEZING	MEAN WH. MOVEMENT	MEAN WH. FREEZING	TOTAL BL. TIME	TOTAL WH. TIME	CROSSES TO BL.	CROSSES TO WH.	TOTAL CROSSES	BLACK FR. RATIO	WHITE FR. RATIO
CONSTANCY (A)	$p<.01$	--	--	$p<.01$	$p<.01$	--	--	$p<.05$	$p<.01$	$p<.01$	$p<.01$	$p<.05$	$p<.05$	--	--	$p<.01$	$p<.01$	$p<.01$	$p<.01$	$p<.01$
WAVEFORM (B)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
INTENSITY (C)	$p<.05$	--	--	$p<.05$	--	--	--	--	$p<.05$	--	--	$p<.05$	--	--	--	$p<.05$	$p<.05$	$p<.01$	--	--
A x B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
A x C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B x C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
A x B x C	--	--	--	--	$p<.05$	--	--	--	--	--	--	--	--	--	--	$p<.01$	$p<.01$	$p<.01$	--	--
TIME E	$p<.01$	$p<.01$	$p<.01$	--	$p<.01$	$p<.05$	$p<.01$	$p<.01$	$p<.01$	--	$p<.01$	--	$p<.01$	--	--	$p<.01$	$p<.01$	$p<.05$	$p<.01$	$p<.05$
A x E	--	--	--	--	--	--	--	--	$p<.05$	--	--	$p<.01$	--	--	--	--	--	--	--	--
B x E	$p<.05$	--	--	--	--	--	--	--	$p<.01$	$p<.05$	--	--	--	--	--	--	--	--	--	--
C x E	$p<.05$	--	--	--	--	--	--	--	--	$p<.01$	--	--	$p<.05$	--	--	--	--	--	--	--
A x B x E	$p<.01$	--	--	--	--	$p<.05$	--	--	$p<.01$	$p<.01$	--	$p<.05$	--	--	--	--	$p<.05$	--	$p<.01$	--
A x C x E	--	--	--	--	--	$p<.05$	--	--	--	--	--	--	--	$p<.05$	--	--	--	--	--	--
B x C x E	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
A x B x C x E	--	$p<.05$	$p<.05$	--	--	--	--	--	$p<.05$	--	--	--	--	--	--	--	--	--	--	--

APPENDIX E

Summaries of the means and of the analyses of variance of response acquisition measures.

Parameter identification key:

Constancy

A1 - Constant current
A2 - Constant voltage

Waveform

B1 - Sine wave
B2 - Square wave

Intensity

C1 - 5 db
C2 - 10 db
C3 - 15 db

Frequency

D1 - 60 Hz
D2 - 120 Hz
D3 - 240 Hz
D4 - 480 Hz
D5 - 960 Hz

Time

E1----EN - shock presentation (quarter, half, or whole)

TABLE 1. MEANS - MOVEMENT IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
D1 C1	148.6167	238.6667	145.6000	171.6333
C2	155.0667	166.6667	147.1167	151.5167
C3	178.2667	165.3167	136.8833	163.7333
D2 C1	160.3000	161.8000	200.8333	141.0667
C2	163.4333	206.6500	121.5833	115.0167
C3	151.7000	132.2667	142.3000	131.5667
D3 C1	128.4000	186.3333	153.2167	143.5500
C2	142.5833	172.0167	151.2000	135.0333
C3	160.2833	166.3167	132.0167	154.5333
D4 C1	180.8500	140.8333	154.2167	115.8500
C2	178.7167	147.6167	121.5333	137.0667
C3	141.1333	133.3000	122.3500	164.6167
D5 C1	173.4167	153.0667	170.1667	135.1000
C2	187.3000	175.1500	168.5833	144.3833
C3	143.7333	131.4833	155.5833	141.3500

TABLE 2. ANALYSIS OF VARIANCE - MOVEMENT IN BLACK

SOURCE	MS	DF	F
CONST (A)	173.500	1.	0.111
MV-FRM (B)	33290.875	1.	21.332
INTEN (C)	4982.063	2.	3.192
FREQ (D)	2298.313	4.	1.473
A X B	7025.250	1.	4.502
A X C	213.813	2.	0.137
A X D	3518.594	4.	2.255
B X C	5125.313	2.	3.284
B X D	1478.906	4.	0.948
C X D	1374.703	8.	0.881
A X B X C	12978.438	2.	8.316
A X B X D	3903.531	4.	2.501
A X C X D	2949.047	8.	1.890
B X C X D	2968.703	8.	1.902
A X B X C X D	853.859	8.	0.547
ERROR	1560.615	300.	

TABLE 3. MEANS - FREEZING IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
D1 C1	151.3833	81.3333	150.4000	176.3667
C2	144.5333	133.3333	152.6833	168.4833
C3	121.7333	134.6833	163.1167	139.2667
D2 C1	139.7000	138.2000	95.1667	168.9333
C2	136.5667	93.9500	178.4167	184.5833
C3	148.3000	167.7333	157.7000	166.0333
D3 C1	171.6000	113.6667	146.7833	146.4500
C2	157.0167	127.3833	148.8000	164.3667
C3	135.7167	139.6833	167.9833	145.0667
D4 C1	115.3500	159.1667	145.7833	180.1500
C2	121.2833	157.3833	166.0667	162.5333
C3	158.8667	166.7000	177.6500	130.3833
D5 C1	126.5833	160.9333	125.6333	164.9500
C2	112.7000	124.8500	131.4167	155.6167
C3	156.2667	166.5167	144.0167	158.6500

TABLE 4. ANALYSIS OF VARIANCE - FREEZING IN BLACK

SOURCE	MS	DF	F
CONST (A)	173.875	1.	0.111
MV-FRM (B)	33291.000	1.	21.332
INTEN (C)	4982.156	2.	3.192
FREQ (D)	2298.266	4.	1.473
A X B	7024.750	1.	4.501
A X C	213.469	2.	0.137
A X D	3518.500	4.	2.255
B X C	5125.063	2.	3.284
B X D	1478.891	4.	0.948
C X D	1374.688	8.	0.881
A X B X C	12978.844	2.	8.316
A X B X D	3903.703	4.	2.501
A X C X D	2949.133	8.	1.890
B X C X D	2968.773	8.	1.902
A X B X C X D	853.734	8.	0.547
ERROR	1560.618	300.	

TABLE 5. MEANS - MOVEMENT IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
D1 C1	58.2500	172.4667	45.2500	105.4833
C2	78.7167	72.7667	72.2500	62.6333
C3	54.2833	78.2500	118.3667	41.2167
D2 C1	55.3833	180.1333	62.0167	60.0500
C2	50.6500	133.2500	56.3500	37.2833
C3	67.0333	47.2333	47.6000	22.3333
D3 C1	41.0333	90.9833	56.2500	82.8167
C2	84.7000	87.9167	58.5667	43.7667
C3	88.4333	73.5667	66.9167	55.0500
D4 C1	100.2667	158.8000	61.3833	63.3500
C2	63.4667	72.8167	45.8333	68.9667
C3	56.0833	43.1833	7.4000	77.1167
D5 C1	84.3333	102.7167	57.0833	33.5333
C2	87.4833	122.6167	71.5333	63.5833
C3	68.2667	44.2000	86.5333	83.2500

TABLE 6. ANALYSIS OF VARIANCE - MOVEMENT IN WHITE

SOURCE	MS	DF	F
CONST (A)	14527.641	1.	4.465
MV-FRM (B)	44227.391	1.	13.592
INTEN (C)	15180.578	2.	4.665
FREQ (D)	1688.152	4.	0.519
A X B	24710.016	1.	7.594
A X C	21536.180	2.	6.619
A X D	2741.027	4.	0.842
B X C	12357.352	2.	3.798
B X D	3043.020	4.	0.935
C X D	4800.254	8.	1.475
A X B X C	6872.469	2.	2.112
A X B X D	5061.531	4.	1.556
A X C X D	4909.412	8.	1.509
B X C X D	3067.146	8.	0.943
A X B X C X D	3295.021	8.	1.013
ERROR	3253.908	300.	

TABLE 7. MEANS - FREEZING IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
B1 C1	241.7500	127.5333	254.7500	194.5167
C2	221.2833	227.2333	227.7500	237.3667
C3	245.7167	221.7500	181.6333	258.7833
B2 C1	240.6167	119.8667	237.3833	239.9500
C2	245.3500	166.7500	243.6500	262.7167
C3	232.9667	252.7667	252.4000	277.6667
B3 C1	258.9667	209.0167	243.7500	217.1833
C2	215.3000	212.0833	201.4333	256.2333
C3	211.5667	226.4333	233.0833	244.9500
B4 C1	195.7333	141.2000	238.6167	236.6500
C2	236.5333	227.1833	250.1667	231.0333
C3	243.9167	258.8167	292.1000	222.8833
B5 C1	215.6667	197.2833	242.9167	266.4667
C2	212.5167	177.3833	228.4667	236.4167
C3	231.7333	255.2000	213.4667	216.7500

TABLE 8. ANALYSIS OF VARIANCE - FREEZING IN WHITE

SOURCE	MS	DF	F
CONST (A)	14550.000	1.	4.472
BV-FRP (B)	44249.500	1.	13.599
INTEN (C)	15192.375	2.	4.669
FREQ (D)	1690.188	4.	0.519
A X B	24689.250	1.	7.588
A X C	21525.250	2.	6.615
A X D	2735.500	4.	0.841
B X C	12346.625	2.	3.794
B X D	3037.563	4.	0.934
C X D	4797.344	8.	1.474
A X B X C	6882.500	2.	2.115
A X B X D	5066.563	4.	1.557
A X C X D	4912.063	8.	1.510
B X C X D	3069.750	8.	0.943
A X B X C X D	3292.500	8.	1.012
ERROR	3253.872	300.	

TABLE 9. MEANS - NO. MOVEMENTS IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
B1 C1	10.3333	8.8333	9.3333	10.8333
C2	12.1667	9.3333	11.1667	9.8333
C3	10.8333	11.1667	11.8333	9.8333
B2 C1	11.0000	10.1667	7.8333	10.5000
C2	11.0000	7.8333	11.8333	11.1667
C3	10.5000	10.1667	12.3333	11.5000
B3 C1	10.1667	9.0000	10.8333	11.5000
C2	12.6667	9.8333	11.6667	11.0000
C3	10.8333	10.6667	11.8333	12.1667
B4 C1	9.1667	10.3333	11.0000	11.0000
C2	11.0000	10.1667	11.8333	11.8333
C3	14.0000	12.0000	12.6667	10.6667
B5 C1	10.5000	9.5000	9.0000	9.8333
C2	10.5000	11.1667	9.1667	11.8333
C3	11.6667	11.8333	11.5000	12.1667

TABLE 10. ANALYSIS OF VARIANCE - NO. MOVEMENTS IN BLACK

SOURCE	MS	DF	F
CONST (A)	15.625	1.	2.823
BV-FRP (B)	23.002	1.	4.156
INTEN (C)	65.519	2.	11.837
FREQ (D)	15.490	4.	2.799
A X B	40.669	1.	7.348
A X C	10.258	2.	1.853
A X D	9.201	4.	1.662
B X C	1.186	2.	0.214
B X D	4.315	4.	0.780
C X D	2.103	8.	0.380
A X B X C	17.669	2.	3.192
A X B X D	1.010	4.	0.182
A X C X D	8.626	8.	1.559
B X C X D	12.769	8.	2.307
A X B X C X D	2.885	8.	0.521
ERROR	5.535	300.	

TABLE 11. MEANS - NO. FREEZING IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
B1 C1	9.3333	5.8333	8.3333	9.8333
C2	11.1667	6.3333	10.1667	8.8333
C3	9.8333	10.1667	10.8333	8.8333
B2 C1	10.0000	9.1667	8.8333	9.5000
C2	10.0000	6.8333	10.8333	10.1667
C3	9.5000	9.1667	11.3333	10.5000
B3 C1	9.1667	8.0000	9.8333	10.5000
C2	11.6667	8.8333	10.6667	10.0000
C3	9.8333	9.8333	10.8333	11.1667
B4 C1	8.1667	9.5000	10.0000	12.0000
C2	10.0000	9.1667	10.8333	10.8333
C3	13.0000	11.0000	11.8333	9.6667
B5 C1	9.5000	8.5000	8.0000	8.8333
C2	9.5000	10.1667	8.1667	10.8333
C3	10.6667	10.8333	10.5000	11.1667

TABLE 12. ANALYSIS OF VARIANCE - NO. FREEZING IN BLACK

SOURCE	MS	DF	F
CONST (A)	15.211	1.	2.740
BV-FRP (B)	22.500	1.	4.052
INTEN (C)	66.186	2.	11.921
FREQ (D)	16.285	4.	2.933
A X B	38.678	1.	6.966
A X C	10.586	2.	1.907
A X D	9.149	4.	1.648
B X C	1.108	2.	0.200
B X D	4.201	4.	0.757
C X D	2.094	8.	0.378
A X B X C	18.219	2.	3.281
A X B X D	1.199	4.	0.216
A X C X D	9.097	8.	1.638
B X C X D	12.320	8.	2.219
A X B X C X D	2.834	8.	0.510
ERROR	5.552	300.	

TABLE 13. MEANS - NO. MOVEMENTS IN WHITE

		A1 B1	A2 B1	A1 B2	A2 B2
D1	C1	6.6667	7.5000	3.3333	5.1667
	C2	7.1667	7.5000	5.8333	5.1667
	C3	5.8333	8.6667	7.5000	4.1667
D2	C1	5.3333	7.3333	6.3333	7.3333
	C2	7.8333	9.5000	5.8333	4.1667
	C3	4.6667	6.1667	5.6667	3.8333
D3	C1	5.8333	6.6667	5.5000	8.1667
	C2	5.8333	3.1667	7.3333	4.0000
	C3	6.6667	7.3333	7.3333	6.0000
D4	C1	7.1667	5.8333	6.8333	4.5000
	C2	6.3333	4.6667	6.6667	4.6667
	C3	7.5000	5.1667	6.3333	9.3333
D5	C1	6.1667	10.0000	5.1667	4.1667
	C2	4.1667	8.8333	6.0000	7.3333
	C3	7.5000	4.6667	5.3333	4.1667

TABLE 14. ANALYSIS OF VARIANCE - NO. MOVEMENTS IN WHITE

SOURCE	MS	DF	F
CONST (A)	1.225	1.	0.100
BV-FRM (B)	81.225	1.	6.648
INTEN (C)	2.019	2.	0.165
FREQ (D)	0.940	4.	0.077
A X B	17.336	1.	1.419
A X C	12.308	2.	1.007
A X D	6.065	4.	0.496
B X C	1.425	2.	0.117
B X D	17.732	4.	1.451
C X D	14.311	8.	1.171
A X B X C	5.036	2.	0.412
A X B X D	21.135	4.	1.730
A X C X D	26.357	8.	2.157
B X C X D	13.476	8.	1.103
A X B X C X D	22.856	8.	1.871
ERROR	12.218	300.	

TABLE 15. MEANS - NO. FREEZING IN WHITE

		A1 B1	A2 B1	A1 B2	A2 B2
D1	C1	6.5000	6.6667	3.1667	4.5000
	C2	7.0000	7.1667	5.6667	4.8333
	C3	5.8333	8.3333	6.6667	4.0000
D2	C1	5.0000	6.6667	6.0000	6.8333
	C2	7.8333	9.0000	5.6667	4.1667
	C3	4.5000	6.0000	5.5000	3.6667
D3	C1	5.6667	6.5000	5.3333	7.8333
	C2	5.5000	2.6667	6.8333	3.8333
	C3	6.1667	7.1667	6.8333	5.8333
D4	C1	6.6667	5.1667	6.6667	4.5000
	C2	6.1667	4.1667	6.6667	4.5000
	C3	7.1667	5.0000	2.1667	9.0000
D5	C1	5.8333	9.6667	4.8333	4.1667
	C2	4.0000	8.0000	5.8333	7.0000
	C3	7.0000	4.6667	4.8333	3.6667

TABLE 16. ANALYSIS OF VARIANCE - NO. FREEZING IN WHITE

SOURCE	MS	DF	F
CONST (A)	0.278	1.	0.025
BV-FRM (B)	71.111	1.	6.415
INTEN (C)	1.319	2.	0.119
FREQ (D)	0.678	4.	0.061
A X B	10.678	1.	0.963
A X C	12.036	2.	1.086
A X D	5.361	4.	0.484
B X C	1.336	2.	0.121
B X D	19.542	4.	1.763
C X D	15.184	8.	1.370
A X B X C	3.186	2.	0.287
A X B X D	19.414	4.	1.751
A X C X D	23.505	8.	2.121
B X C X D	13.048	8.	1.177
A X B X C X D	19.266	8.	1.738
ERROR	11.084	300.	

TABLE 17. MEANS - TOTAL-FREEZING

		A1 B1	A2 B1	A1 B2	A2 B2
D1	C1	393.1333	188.8667	405.1500	370.6833
	C2	366.2167	360.5667	380.6333	405.8500
	C3	367.4500	356.4333	344.7500	398.0500
D2	C1	380.3167	258.0667	336.5500	408.8833
	C2	385.9167	260.7000	422.0667	447.7000
	C3	381.2667	420.5000	410.1000	445.7000
D3	C1	430.5667	322.6833	390.5333	363.6333
	C2	372.3167	339.4667	350.2333	420.6000
	C3	351.2833	366.1167	401.0667	390.0167
D4	C1	319.0833	300.3667	384.4000	416.8000
	C2	357.8167	384.5667	418.2333	393.9667
	C3	402.7833	423.5167	465.7500	353.2667
D5	C1	342.2500	304.2167	372.5500	431.3667
	C2	325.2167	302.2333	355.8833	392.0333
	C3	388.0000	423.7167	357.4833	375.4000

TABLE 18. ANALYSIS OF VARIANCE - TOTAL-FREEZING

SOURCE	MS	DF	F
CONST (A)	11690.000	1.	1.798
BV-FRM (B)	154304.000	1.	23.737
INTEN (C)	37531.500	2.	5.774
FREQ (D)	7345.000	4.	1.130
A X B	58050.500	1.	8.930
A X C	17901.000	2.	2.754
A X D	4434.250	4.	0.682
B X C	28268.000	2.	4.349
B X D	4264.875	4.	0.656
C X D	7631.500	8.	1.174
A X B X C	38516.000	2.	5.925
A X B X D	16614.375	4.	2.556
A X C X D	12362.188	8.	1.902
B X C X D	8839.438	8.	1.360
A X B X C X D	2798.313	8.	0.430
ERROR	6500.542	300.	

TABLE 19. MEANS - MEAN MOVEMENT IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
D1 C1	14.9500	39.1333	16.9833	11.8167
C2	13.9833	24.6833	13.3000	15.7167
C3	17.1000	16.5500	12.2333	18.1333
D2 C1	15.4667	19.6500	45.0167	12.8667
C2	16.0000	30.1667	10.3833	11.0333
C3	14.8000	13.0333	12.0667	11.5667
D3 C1	13.2667	22.1833	16.2500	14.1667
C2	11.6667	27.1333	13.2333	12.7500
C3	15.1667	16.9333	11.6333	13.6000
D4 C1	20.6500	32.3500	14.9667	9.6500
C2	16.4833	15.6667	11.2000	12.3500
C3	10.2333	11.6167	5.7000	17.3833
D5 C1	17.0667	22.2500	20.8167	14.0000
C2	18.6333	16.3333	15.4667	12.5000
C3	12.8000	11.6000	14.3667	12.2000

TABLE 20. ANALYSIS OF VARIANCE - MEAN MOVEMENT IN BLACK

SOURCE	MS	DF	F
CONST (A)	241.552	1.	1.497
BV-FRM (B)	1127.988	1.	6.989
INTEN (C)	1105.090	2.	6.848
FREQ (D)	107.060	4.	0.663
A x B	1766.107	1.	10.943
A x C	76.997	2.	0.477
A x D	283.128	4.	1.754
B x C	207.392	2.	1.285
B x D	111.274	4.	0.689
C x D	70.792	8.	0.439
A x B x C	1064.582	2.	6.597
A x B x D	112.948	4.	0.700
A x C x D	198.463	8.	1.230
B x C x D	327.015	8.	2.026
A x B x C x D	84.992	8.	0.527
ERROR	161.386	300.	

TABLE 21. MEANS - MEAN FREEZING IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
D1 C1	16.6500	10.1167	17.7167	18.1167
C2	13.0500	14.2833	15.2667	18.7667
C3	12.3500	14.0833	15.4000	16.4667
D2 C1	13.7500	15.9667	17.8167	18.3667
C2	14.0333	13.5167	16.6333	19.1167
C3	15.8000	18.8833	14.2000	16.3667
D3 C1	19.0333	14.1167	16.1833	13.9667
C2	13.4667	14.2000	14.6667	16.6000
C3	14.4333	14.4500	15.4333	13.0000
D4 C1	14.1833	15.9333	14.7167	14.9833
C2	12.5167	17.5000	15.6667	15.2333
C3	12.3000	15.4667	15.2500	13.5000
D5 C1	13.4833	12.5333	17.1833	19.2333
C2	11.9000	12.5667	17.0000	15.0833
C3	14.8167	15.9167	14.3333	15.0500

TABLE 22. ANALYSIS OF VARIANCE - MEAN FREEZING IN BLACK

SOURCE	MS	DF	F
CONST (A)	20.130	1.	1.164
BV-FRM (B)	250.275	1.	14.471
INTEN (C)	22.817	2.	1.319
FREQ (D)	23.865	4.	1.380
A x B	0.092	1.	0.005
A x C	33.974	2.	1.964
A x D	21.908	4.	1.267
B x C	60.301	2.	3.487
B x D	42.512	4.	2.458
C x D	5.674	8.	0.328
A x B x C	26.862	2.	1.553
A x B x D	26.818	4.	1.551
A x C x D	16.217	8.	0.938
B x C x D	21.390	8.	1.237
A x B x C x D	8.465	8.	0.489
ERROR	17.295	300.	

TABLE 23. MEANS - MEAN MOVEMENT IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
D1 C1	9.6000	25.5167	15.1833	17.9833
C2	10.7000	7.9333	14.7833	8.8667
C3	8.7000	10.0667	17.7667	6.9333
D2 C1	15.3500	29.4000	12.6667	7.4000
C2	7.3000	15.7667	10.5833	10.9000
C3	12.2167	5.3167	7.1000	6.7000
D3 C1	8.1833	14.9667	15.2500	11.3500
C2	14.7000	25.6667	13.9167	12.5500
C3	15.9167	9.3667	8.0667	7.1833
D4 C1	14.2667	33.7167	8.2500	17.6000
C2	10.7167	15.5167	5.9667	14.0333
C3	5.5333	6.8833	2.9833	7.5333
D5 C1	13.1333	10.0333	11.4667	10.2333
C2	19.7000	13.9333	20.4333	9.7833
C3	8.3333	14.5833	15.7167	16.0167

TABLE 24. ANALYSIS OF VARIANCE - MEAN MOVEMENT IN WHITE

SOURCE	MS	DF	F
CONST (A)	242.635	1.	1.890
BV-FRM (B)	459.990	1.	3.583
INTEN (C)	912.412	2.	7.107
FREQ (D)	45.968	4.	0.358
A x B	630.097	1.	4.908
A x C	356.345	2.	2.776
A x D	263.773	4.	2.054
B x C	159.136	2.	1.239
B x D	176.516	4.	1.375
C x D	303.427	8.	2.363
A x B x C	177.270	2.	1.381
A x B x D	48.047	4.	0.374
A x C x D	168.628	8.	1.313
B x C x D	118.129	8.	0.920
A x B x C x D	96.014	8.	0.748
ERROR	128.388	300.	

TABLE 25. MEANS - MEAN FREEZING IN WHITE

		A1 B1	A2 B1	A1 B2	A2 B2
D1	C1	81.3667	21.4333	134.4833	91.3833
	C2	40.4500	73.9167	55.3333	105.7333
	C3	49.3333	31.0333	46.9667	107.2000
D2	C1	60.0500	18.1167	64.5167	50.4000
	C2	35.8500	24.2833	66.9333	96.2333
	C3	121.8500	67.7667	101.3500	113.8167
D3	C1	132.6167	40.6500	89.1167	32.5167
	C2	78.8500	126.4333	32.9500	88.7333
	C3	37.0833	49.5000	67.0667	53.6167
D4	C1	39.9667	63.6833	87.0500	95.7333
	C2	55.7500	90.3667	58.6167	64.1667
	C3	91.0667	75.4500	253.1833	69.2167
D5	C1	41.2000	29.7500	55.8500	105.7000
	C2	66.7167	22.7500	106.9833	62.4500
	C3	39.6500	86.3167	89.8000	89.6333

TABLE 26. ANALYSIS OF VARIANCE - MEAN FREEZING IN WHITE

SOURCE	MS	DF	F
CONST (A)	5479.031	1.	0.970
UV-FRM (B)	55279.344	1.	9.789
INTEN (C)	8808.266	2.	1.560
FREQ (D)	5085.672	4.	0.901
A x B	442.203	1.	0.078
A x C	12903.492	2.	2.285
A x D	1779.172	4.	0.315
B x C	3833.563	2.	0.679
B x D	10166.254	4.	1.800
C x D	11107.793	8.	1.967
A x B x C	3750.797	2.	0.664
A x B x D	9457.031	4.	1.675
A x C x D	16072.029	8.	2.846
B x C x D	4819.361	8.	0.853
A x B x C x D	3833.760	8.	0.679
ERROR	5646.991	300.	

TABLE 27. MEANS - PHASE SHIFT

			E1	E2	E3
A1	C1	D1	28.766	38.420	31.364
		D2	45.047	40.657	11.852
		D3	52.298	28.771	35.825
		D4	73.938	34.011	58.269
		D5	79.731	65.324	69.824
	C2	D1	19.588	0.558	10.781
		D2	44.750	27.650	20.450
		D3	52.087	14.222	12.000
		D4	53.134	22.558	45.058
		D5	81.491	48.468	64.472
	C3	D1	4.933	6.039	16.169
		D2	10.011	13.052	6.428
		D3	20.660	30.531	24.906
		D4	63.375	30.225	42.300
		D5	36.198	49.579	56.150
A2	C1	D1	21.897	33.383	26.109
		D2	32.879	34.129	34.035
		D3	72.760	44.814	51.130
		D4	50.704	70.763	72.200
		D5	84.446	64.645	84.623
	C2	D1	37.967	36.505	12.012
		D2	33.346	37.682	32.205
		D3	63.135	47.287	24.183
		D4	71.370	80.571	70.428
		D5	79.067	56.782	70.496
	C3	D1	21.098	23.737	20.138
		D2	18.593	4.978	22.992
		D3	33.968	33.045	15.500
		D4	12.867	11.322	5.269
		D6	86.333	46.286	30.286

TABLE 28. ANALYSIS OF VARIANCE - PHASE SHIFT

SOURCE			
CONST (A)	6162.0313	1	8.219
INTEN (C)	24659.3711	2	32.889
FREQ (D)	32270.7480	4	43.041
A x C	3411.3828	2	4.550
A x D	413.9492	4	0.552
C x D	1017.4434	8	1.357
A x C x D	2544.9512	8	3.394
ERROR	749.7732	150	
TIME (E)	6730.9258	2	10.292
A x E	832.0586	2	1.272
C x E	665.0645	4	1.017
D x E	1002.5596	8	1.533
A x C x E	1590.0078	4	2.431
A x D x E	1507.0918	8	2.305
C x D x E	575.2114	16	0.880
A x C x D x E	335.2871	16	0.513
ERROR	653.9669	300	

TABLE 29. MEANS - RELATIVE AMPLITUDE OF JUMPS BY QUARTER SHOCK PRESENTATION

	B1————————[illegible]
B1 C1 B1 A1	6. 0.19.16.18.14.17.15.14.10.13.14.17.16.21.12.17.20.28.13.18.23.24.32.31.23.18.25.27.36.29.32.17.30.39.35.
A2	0. 0. 0. 0. 4. 0. 0. 0. 0. 3. 0. 3. 5. 4. 8. 7. 3. 6. 3. 9.11. 0. 8. 5. 9. 4. 6. 8. 6.12. 3. 8.10. 0. 6. 8.
B2 A1	12.11.17.20.26.28.29.18.20.22.22.13.27.15.16.21.26.24.26.25.25.25.32.29.17.10.30.26.28.15.24.22.21.21.28.15.
A2	3. 0. 0. 0. 0. 0. 5. 4. 3. 8. 5. 5. 4. 0. 6. 5.11. 3. 4. C. 0. 0. 6. 0. 0. 0. 0. 0. 4. 4. 9. 3. 7. 3. 8.13.
C2 B1 A1	3C.31.32.30.33.31.35.30.39.27.32.30.31.33.32.40.37.27.34.29.26.43.41.30.23.26.26.31.28.32.27.27.28.35.37.35.
A2	1C.14.11. 9.14.18.14.23.19.22.17.21.14.23.20.26.25.20.12.13.17.33.29.11.18.32.29.16.17.12.35.32.34.16.26.27.
B2 A1	25.34.3C.42.31.35.43.35.31.33.37.32.32.34.38.31.38.29.34.33.30.22.22.21.39.28.27.26.38.24.29.14.31.38.33.23.
A2	12. 7.11. 9.14.15.11. 7.14.14. 5. 6. 8. 9.13.14.14.20.10.15.15.19.20.16.15.18.15.13.18.26.19. 9.16.31.27.15.
C3 B1 A1	38.43.38.35.39.46.26.19.36.17.18.11.36.23.21.14.22.31.15.10.28.22.19.13.16. 9.12. 8.17.10. 3.11. 8.17. 4.10.
A2	35.31.41.36.35.33.35.36.31.34.47.28.42.48.35.38.29.39.36.31.33.27.32.27.39.39.30.25.34.29.25.22.26.33.32.30.
B2 A1	34.36.30.32.35.25.36.3C.39.40.36.25.41.36.39.26.35.35.29.27.35.26.25.27.31.35.28.26.35.32.25.24.30.34.25.22.
A2	19.24.26.26.23.36.36.28.36.23.35.25.34.24.34.18.33.31.29.28.31.26.25.27.34.29.27.20.15.27.24.14.18.21.25.18.
B2 C1 B1 A1	14.13.22.21.22.23.23.15.14.26.16.17.20.17.15.22.23.17.17.27.18.16.17.24.17.23.22.17.26.15.17.18.29.15.19.32.
A2	0. 0. 0. 0. 0. 6. C. 0. C. 0. 0. 0. 0. 0. 0. 0. 5. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 3. 0. 0. 0. 3. 0. 0. 0.
B2 A1	19.11.19.12.25.16.23.28.31.21.28.31.28.41.18.16.23.21.12.23.25.33.32.45.24.28.20.19.32.31.29.36.22.17.36.33.
A2	10.18.13.19.13.20.14.10.24.20.10. 9.16.18.13.10.11.16. 8.10.18.13.15.14.11.13.10. 7.12.11.13.33.19.12.15.10.
C2 B1 A1	21.24.23.22.31.26.25.21.25.27.33.33.25.32.28.28.24.34.26.32.29.23.26.25.24.23.20.28.31.28.31.27.22.28.27.35.
A2	26.20.26.14.29.21.21.23.21.23.15.13.26.30.18.33.28.33.23.18.28.26.29.22.33.25.35.21.26.23.30.24.30.28.32.26.
B2 A1	31.33.30.36.37.36.42.36.4C.3C.37.38.31.32.24.21.35.39.28.27.30.27.33.30.28.33.29.32.22.29.20.24.35.26.33.28.
A2	11.13. 9.13.20. 8. 9.10.13.25.24.24.24.10.22.21.15. 9.29.19.26.22.21.27.19.24.22.13.27.26.27.24.16.20.32.18.
C3 B1 A1	35.31.29.42.31.24.21.20.24.3C.26.23.28.21.26.19.24.19.14.17.23.15.17.14.20.11. 8.19.19.20.18.13.20.13.20.19.
A2	32.41.23.28.28.32.35.34.31.34.32.27.30.26.30.22.34.22.29.11.27.19.20. 7.19.19.19.12.14.32.10. 7.24.16.16.11.
B2 A1	12.21.18.20.15.23.14.12.16.22.15. 8.22.16.22. 9.23.18.18.12.21.12.12.11.21.34.19.21.22.27.24.21.26.17.19.19.
A2	3.30.31.30.26.25.33.30.21.16.27.24.27.35.28.23.26.31.24.22.18.24.19.24.20.25.19.18.23.17.27.17.15.21.19.13.
B3 C1 B1 A1	23.34.27.13.30.27.29.26.22.26.28.27.35.13.24.42.25.35.28.25.27.27.23.28.29.27.35.35.28.29.22.23.24.24.31.36.
A2	0. 3. 0. 3. 5. 5. C. 3. 7. 8. 5. 8.25. 7.12. 8.24. 8. 9.10.16. 0.11. 5.18. 5. 9.18.12.14.17.15.11. 3.11.13.
B2 A1	32.29.28.37.24.38.40.25.34.28.31.34.33.37.36.33.34.37.36.29.29.37.28.30.31.40.36.28.39.27.34.21.29.34.40.38.
A2	13.16.11.14.25.27.12.18.20.26.17.21.13.19.26.17.18.10.22.21.16.21.27. 9.18.26.23.25.21.28.14.25.19.18.29.25.
C2 B1 A1	2C.23.2C.11.24.22.24.22.3C.3C.34.32.27.30.24.24.32.27.26.3C.27.25.22.25.26.24.16.13.34.28.23.26.16.29.30.22.
A2	8. 7. 8. 4.12.22.13. 5.14.16. 9.23.20.16. 7.22.24.21.15.11.22.19.16.18.20.16.24.11. 7.18.16.12. 5.12.11.23.
B2 A1	41.36.32.34.37.41.42.37.36.31.23.35.28.36.36.34.36.29.11.34.27.26.27.26.29.34.27.25.25.27.27.29.31.31.29.25.
A2	31.29.20.25.23.32.22.25.22.24.28.12.18.28.25.43.25.31.33.25.16.20.20.22.25.30.30.32.26.32.26.44.31.29.21.35.
C3 B1 A1	33.25.23.34.31.33.35.16.31.26.26.27.3C.32.34.15.29.26.21.17.32.28.27.23.32.25.22.17.30.28.22.20.25.16.17.15.
A2	28.32.24.33.31.35.18.26.26.3C.27.20.28.33.28.30.28.26.26.36.27.29.27.12.22.27.15.23.19.17.14.10.23.19.17.19.
B2 A1	34.39.25.26.24.3C.34.28.3C.33.27.25.25.29.20.22.27.22.28.17.28.18. 8. 0.23.13.11.13.26.18.16.10.22.16. 4.11.
A2	29.41.35.36.31.23.25.3C.3C.25.25.26.25.24.27.31.26.27.25.18.21.21.22.21.18.17.25.20.19.18.22.19.21.21.15.20.
B4 C1 B1 A1	33.17.18.28.32.43.25.19.27.33.3C.31.38.27.37.3C.27.28.26.34.28.40.30.26.25.31.34.38.34.26.25.29.36.30.34.35.
A2	16. 5.10. 7.14. 8. 7. C. 7. 3. 5.12. 9. 8.14.10.16.18. 8. 8.1C. 7. 9.14.13.10.13.12.10. 9.11. 6. 5. 9.10. 4.
B2 A1	34.29.30.29.36.25.39.32.35.36.33.29.31.32.33.28.35.38.39.34.32.33.35.42.30.31.31.39.33.35.26.33.32.32.27.33.
A2	25.22.12.14.14.21.18.11.23. 8.12.14. 8.18.15.15.17.25.25.12.18.21.14.19.14.23.17.15.17.24.21.19.16.14.17.22.
C2 B1 A1	25.16.22.14.27.31.22.25.25.24.2C.18.17.23.22.29.28.30.28.25.15.22.28.22.19.24.23.25.25.24.33.28.27.24.21.24.
A2	19.18. 5.12.2C.14.15.19.17.28.18.23.25.30.36.25.20.27.29.28.28.24.29.24.21.20.24.24.22.23.37.24.35.26.36.37.
B2 A1	37.33.38.30.33.35.27.30.35.26.28.21.23.24.24.25.28.15.12.27.18.18. 9.11.25.18.19.16.19.16.13.11.25.14.18.15.
A2	22.12.26.2C.17.24.22. 7.26.26.24.26.25.20.25.12.24.21.26.25.28.25.35.30.28.23.32.27.27.25.41.32.23.32.26.30.
C3 B1 A1	36.31.30.30.36.31.31.24.37.35.26.26.46.38.26.27.32.29.14.17.38.19.16.21.27.39.28.14.32.37.21.17.33.32.22.24.
A2	28.35.31.36.31.4C.25.26.26.27.3C.22.34.30.24.26.16.25.21.24.21.18.17.17.24.29.23.26.29.22.21.19.20.18.19.14.
B2 A1	28.27.37.33.36.35.25.37.33.39.23.32.35.36.38.28.23.24.29.19.29.15. 9. 3.18.2C.11.10.19. 6. 5. 6.18. 9.11. 0.
A2	19.31.27.24.32.31.32.24.21.29.34.36.31.18.27.29.27.29.25.21.26.24.23.26.25.32.26.26.21.28.33.29.30.20.27.30.
B5 C1 B1 A1	26.36.26.31.36.31.24.26.3C.34.37.27.34.34.35.31.33.31.29.34.32.29.37.43.28.35.39.27.33.34.32.36.34.35.37.43.
A2	23.16.12.12.25.25.12.15.25.25.17.20.23.22.19.19.21.18.16.28.17.27.22.26.13.24.14.26.14. 5. 4.18.12.25.19.29.
B2 A1	26.27.32.35.39.37.32.36.35.36.36.28.31.43.41.38.36.38.40.36.31.39.33.40.39.44.33.48.32.34.37.19.33.36.35.37.
A2	28.17.15.16.2C.15.17.10.15.21.27.20.15.16.14.27.21.26.11.19.25.24.17.22.22.21.15.17.20.23.26.18.10.14.21.29.
C2 B1 A1	33.37.34.36.44.44.4C.37.34.11.4C.27.42.37.34.45.39.42.40.44.42.35.35.19.33.41.44.41.35.39.35.30.36.36.28.43.
A2	25.26.22.22.29.31.43.33.31.4C.35.28.31.37.41.37.35.33.30.32.38.33.32.34.35.38.34.34.34.25.32.23.33.35.31.34.
B2 A1	31.39.41.41.32.37.45.35.37.36.37.35.35.35.38.36.42.36.38.32.41.36.35.30.42.39.40.38.40.35.24.35.19.30.25.28.
A2	25.16.16.12.14.16.15.16.21.19.21.21.27.13.14.20.25.26.21.22.23.23.26.19.18.11.13.27.22.14.21.25.25.21.21.21.
C3 B1 A1	24.28.28.31.33.34.35.11.27.26.2C.19.28.32.20.14.36.37.35.27.31.36.24.21.31.36.24.25.24.16.16. 3.25.27.27.21.
A2	4C.25.21.28.31.41.27.33.3C.39.33.41.32.31.31.3C.42.34.34.35.44.29.28.19.33.21.23.15.40.22.27.21.25.28.28.14.
B2 A1	26.33.34.34.31.37.42.28.33.32.41.35.32.37.31.35.41.33.35.36.27.24.27.28.33.30.26.28.35.29.29.31.34.36.31.34.
A2	33.33.28.32.39.36.32.15.38.37.36.27.28.31.33.34.32.32.37.28.28.36.37.36.37.39.31.30.28.36.27.23.37.23.23.37.

TABLE 30. ANALYSIS OF VARIANCE - RELATIVE AMPLITUDE OF JUMPS BY QUARTER SHOCK PRESENTATION

BETWEEN SUBJECTS	1917495.938	359.		
CONSTANCY	171486.313	1.	171486.313	46.365
WAVEFORM	7130.375	1.	7130.375	1.928
INTENSITY	108399.688	2.	54199.844	14.654
FREQUENCY	118826.563	4.	29706.641	8.032
CONSTANCY X WAVEFORM	163.313	1.	163.313	0.044
CONSTANCY X INTENSITY	179765.688	2.	89882.844	24.302
CONSTANCY X FREQUENCY	5672.313	4.	1418.078	0.383
WAVEFORM X INTENSITY	18752.938	2.	9376.469	2.535
WAVEFORM X FREQUENCY	14463.438	4.	3615.859	0.978
INTENSITY X FREQUENCY	71989.125	8.	8998.641	2.433
CONSTANCY X WAVEFORM X INTENSITY	6538.500	2.	3269.250	0.884
CONSTANCY X WAVEFORM X FREQUENCY	26351.625	4.	6587.906	1.781
CONSTANCY X INTENSITY X FREQUENCY	26023.813	8.	3252.977	0.880
WAVEFORM X INTENSITY X FREQUENCY	40341.125	8.	5042.641	1.363
CONSTANCY X WAVEFORM X INTENSITY X FREQUENCY	12000.125	8.	1500.016	0.406
ERROR TERM	1109591.375	300.	3698.638	
WITHIN SUBJECTS	2150206.250	12600.		
TIME	25029.000	35.	715.114	4.484
CONSTANCY X TIME	15930.563	35.	455.159	2.854
TIME X WAVEFORM	5624.188	35.	160.691	1.008
TIME X INTENSITY	82665.688	70.	1180.938	7.405
TIME X FREQUENCY	23747.063	140.	169.622	1.064
CONSTANCY X TIME X WAVEFORM	9387.313	35.	268.209	1.682
CONSTANCY X TIME X INTENSITY	25466.125	70.	363.802	2.281
CONSTANCY X TIME X FREQUENCY	28906.125	140.	206.472	1.295
TIME X WAVEFORM X INTENSITY	18338.188	70.	261.974	1.643
TIME X WAVEFORM X FREQUENCY	24957.063	140.	178.265	1.118
TIME X INTENSITY X FREQUENCY	41979.625	280.	149.927	0.940
CONSTANCY X TIME X WAVEFORM X INTENSITY	14548.688	70.	207.838	1.303
CONSTANCY X TIME X WAVEFORM X FREQUENCY	20685.563	140.	147.754	0.926
CONSTANCY X TIME X INTENSITY X FREQUENCY	44489.000	280.	158.889	0.996
TIME X WAVEFORM X INTENSITY X FREQUENCY	48747.625	280.	174.099	1.092
CONSTANCY X TIME X WAVEFORM X INTENSITY X FREQUENCY	45090.875	280.	161.039	1.010
ERROR TERM	1674613.875	10500.	159.487	
TOTALS	4067702.188	12959.		

TABLE 31. MEANS - RELATIVE AMPLITUDE OF JUMPS BY HALF SHOCK PRESENTATION

E1---------------E18

D1	C1	B1	A1	6.	21.	17.	19.	18.	15.	21.	21.	22.	27.	22.	12.	35.	24.	36.	32.	29.	40.
			A2	0.	0.	6.	0.	3.	3.	5.	15.	5.	8.	11.	6.	9.	9.	11.	7.	10.	7.
		B2	A1	23.	26.	25.	30.	27.	20.	27.	18.	28.	26.	25.	32.	17.	31.	31.	30.	25.	24.
			A2	3.	0.	0.	9.	7.	10.	4.	5.	10.	4.	0.	6.	0.	0.	4.	13.	7.	11.
	C2	B1	A1	32.	31.	32.	35.	35.	31.	32.	35.	36.	31.	41.	36.	25.	30.	30.	28.	31.	38.
			A2	16.	20.	15.	21.	24.	21.	24.	27.	22.	14.	32.	34.	27.	24.	22.	33.	34.	27.
		B2	A1	31.	35.	32.	39.	34.	35.	34.	34.	32.	34.	31.	21.	35.	27.	37.	25.	36.	30.
			A2	12.	4.	18.	15.	14.	10.	12.	15.	23.	14.	21.	19.	17.	18.	21.	20.	31.	29.
	C3	B1	A1	39.	41.	40.	35.	37.	16.	13.	21.	28.	19.	35.	19.	21.	15.	18.	7.	16.	8.
			A2	36.	39.	34.	36.	33.	30.	44.	37.	38.	35.	33.	28.	38.	28.	34.	23.	28.	33.
		B2	A1	37.	31.	33.	34.	39.	33.	41.	36.	34.	30.	33.	25.	32.	30.	37.	27.	32.	25.
			A2	26.	29.	34.	35.	28.	41.	33.	37.	36.	41.	30.	28.	30.	26.	27.	25.	23.	24.
D2	C1	B1	A1	14.	21.	24.	22.	24.	18.	14.	21.	23.	25.	20.	26.	22.	25.	23.	32.	26.	31.
			A2	0.	0.	6.	0.	0.	0.	0.	0.	5.	0.	0.	0.	0.	0.	3.	0.	3.	0.
		B2	A1	20.	18.	23.	27.	32.	31.	37.	19.	23.	28.	32.	40.	31.	26.	32.	32.	22.	37.
			A2	16.	16.	18.	12.	24.	14.	22.	17.	15.	9.	17.	15.	16.	12.	16.	25.	18.	21.
	C2	B1	A1	24.	25.	24.	27.	28.	33.	31.	28.	32.	33.	29.	30.	26.	31.	32.	31.	29.	30.
			A2	24.	21.	29.	24.	22.	15.	30.	29.	33.	27.	28.	30.	29.	32.	27.	29.	32.	30.
		B2	A1	32.	35.	37.	40.	35.	37.	32.	24.	37.	29.	29.	41.	33.	30.	26.	22.	33.	31.
			A2	16.	17.	19.	13.	22.	20.	23.	24.	16.	29.	29.	31.	27.	28.	29.	34.	20.	32.
	C3	B1	A1	37.	18.	32.	24.	34.	21.	29.	24.	32.	16.	21.	18.	21.	18.	14.	19.	17.	20.
			A2	37.	27.	30.	35.	33.	16.	31.	27.	35.	26.	26.	20.	23.	19.	27.	10.	20.	15.
		B2	A1	19.	23.	22.	18.	23.	15.	24.	17.	25.	19.	22.	17.	28.	21.	25.	27.	28.	19.
			A2	29.	30.	28.	32.	19.	28.	34.	29.	33.	24.	23.	21.	25.	21.	19.	21.	23.	19.
D3	C1	B1	A1	28.	23.	31.	25.	24.	24.	33.	37.	31.	28.	27.	30.	28.	34.	35.	27.	26.	34.
			A2	3.	4.	10.	3.	3.	5.	27.	4.	22.	19.	16.	12.	14.	17.	15.	16.	10.	14.
		B2	A1	32.	34.	35.	35.	35.	34.	35.	36.	36.	36.	33.	28.	35.	34.	33.	33.	32.	38.
			A2	14.	20.	28.	16.	24.	28.	14.	28.	27.	23.	22.	26.	25.	26.	25.	29.	28.	35.
	C2	B1	A1	22.	20.	25.	26.	31.	34.	29.	27.	30.	24.	29.	31.	29.	23.	31.	28.	30.	34.
			A2	14.	8.	21.	17.	17.	22.	19.	19.	23.	20.	25.	23.	15.	26.	17.	21.	12.	21.
		B2	A1	38.	32.	39.	40.	36.	28.	38.	36.	34.	33.	29.	24.	34.	24.	30.	25.	31.	24.
			A2	31.	26.	33.	24.	25.	34.	33.	39.	32.	34.	21.	28.	30.	33.	31.	39.	29.	33.
	C3	B1	A1	35.	32.	33.	35.	34.	27.	31.	28.	24.	22.	32.	27.	33.	21.	29.	24.	26.	16.
			A2	33.	28.	33.	22.	28.	22.	31.	31.	31.	24.	29.	28.	26.	25.	20.	15.	22.	18.
		B2	A1	34.	26.	31.	33.	30.	27.	24.	21.	27.	24.	25.	8.	25.	13.	25.	14.	19.	11.
			A2	41.	38.	27.	29.	30.	27.	27.	24.	28.	25.	22.	25.	23.	24.	21.	20.	23.	18.
D4	C1	B1	A1	30.	25.	35.	32.	33.	34.	38.	37.	29.	33.	34.	28.	30.	33.	29.	28.	39.	36.
			A2	16.	6.	13.	7.	7.	13.	12.	12.	14.	4.	10.	12.	12.	12.	10.	10.	9.	11.
		B2	A1	31.	31.	34.	34.	37.	31.	32.	33.	38.	36.	34.	38.	31.	39.	34.	30.	33.	35.
			A2	28.	13.	22.	17.	26.	23.	22.	21.	22.	24.	27.	28.	24.	19.	26.	22.	21.	23.
	C2	B1	A1	26.	24.	34.	30.	32.	22.	26.	28.	30.	24.	24.	28.	24.	24.	27.	31.	28.	25.
			A2	19.	17.	13.	22.	30.	21.	32.	31.	30.	24.	28.	24.	19.	26.	24.	36.	34.	40.
		B2	A1	35.	36.	37.	29.	34.	27.	27.	25.	32.	27.	20.	11.	27.	18.	19.	12.	27.	20.
			A2	22.	24.	25.	24.	26.	26.	26.	24.	25.	28.	29.	30.	25.	29.	31.	37.	29.	33.
	C3	B1	A1	31.	24.	35.	32.	36.	28.	43.	35.	36.	18.	35.	20.	34.	27.	35.	22.	34.	23.
			A2	33.	34.	37.	28.	29.	28.	33.	28.	35.	20.	21.	17.	31.	25.	29.	22.	21.	19.
		B2	A1	27.	34.	35.	33.	36.	29.	38.	34.	26.	26.	24.	8.	29.	10.	20.	5.	15.	11.
			A2	34.	27.	33.	31.	27.	35.	27.	28.	30.	24.	27.	24.	32.	27.	26.	30.	24.	28.
D5	C1	B1	A1	31.	34.	38.	27.	34.	38.	35.	37.	33.	39.	32.	38.	32.	40.	33.	32.	35.	40.
			A2	25.	17.	25.	18.	24.	22.	23.	21.	25.	24.	21.	26.	28.	23.	14.	18.	23.	27.
		B2	A1	28.	37.	38.	37.	38.	34.	37.	40.	38.	37.	35.	35.	41.	42.	33.	37.	35.	38.
			A2	26.	26.	23.	17.	19.	27.	21.	24.	27.	19.	27.	25.	21.	24.	27.	25.	14.	27.
	C2	B1	A1	30.	34.	45.	41.	33.	39.	41.	40.	41.	41.	43.	38.	38.	42.	37.	36.	35.	40.
			A2	34.	33.	31.	38.	37.	36.	33.	45.	34.	35.	36.	32.	35.	36.	31.	29.	35.	33.
		B2	A1	34.	42.	34.	41.	38.	36.	36.	17.	19.	36.	38.	40.	40.	39.	37.	37.	36.	27.
			A2	27.	13.	16.	19.	20.	21.	23.	23.	30.	25.	27.	26.	18.	24.	22.	30.	23.	21.
	C3	B1	A1	28.	29.	32.	33.	27.	24.	32.	23.	37.	37.	33.	27.	33.	24.	29.	14.	33.	29.
			A2	40.	26.	31.	33.	34.	36.	32.	35.	37.	35.	39.	32.	35.	23.	33.	32.	26.	28.
		B2	A1	31.	34.	35.	36.	34.	35.	37.	33.	37.	38.	31.	30.	37.	26.	35.	30.	36.	31.
			A2	36.	36.	39.	34.	37.	34.	31.	33.	32.	35.	37.	37.	37.	32.	33.	28.	27.	30.

TABLE 32. ANALYSIS OF VARIANCE - RELATIVE AMPLITUDE OF JUMPS BY HALF SHOCK PRESENTATION

BETWEEN SUBJECTS	859219.000	399.		
CONSTANCY	72574.438	1.	72574.438	44.123
WAVEFORM	3276.813	1.	3276.813	1.992
INTENSITY	50148.000	2.	25074.000	15.244
FREQUENCY	54256.813	4.	13564.203	8.247
CONSTANCY X WAVEFORM	320.875	1.	320.875	0.195
CONSTANCY X INTENSITY	80259.750	2.	40129.875	24.398
CONSTANCY X FREQUENCY	3041.438	4.	760.359	0.462
WAVEFORM X INTENSITY	11638.125	2.	5819.063	3.538
WAVEFORM X FREQUENCY	6517.563	4.	1629.391	0.991
INTENSITY X FREQUENCY	35366.563	8.	4420.820	2.688
CONSTANCY X WAVEFORM X INTENSITY	3570.250	2.	1785.125	1.085
CONSTANCY X WAVEFORM X FREQUENCY	13779.813	4.	3444.953	2.094
CONSTANCY X INTENSITY X FREQUENCY	10806.250	8.	1350.781	0.821
WAVEFORM X INTENSITY X FREQUENCY	17172.625	8.	2146.578	1.305
CONSTANCY X WAVEFORM X INTENSITY X FREQUENCY	3043.250	8.	380.406	0.231
ERROR TERM	493444.438	300.	1644.815	
WITHIN SUBJECTS	718371.250	6120.		
TIME	8939.938	17.	525.879	4.833
CONSTANCY X TIME	7064.938	17.	415.585	3.820
TIME X WAVEFORM	2072.813	17.	121.930	1.121
TIME X INTENSITY	37542.813	34.	1104.200	10.149
TIME X FREQUENCY	7387.375	68.	108.638	0.999
CONSTANCY X TIME X WAVEFORM	3544.563	17.	208.504	1.916
CONSTANCY X TIME X INTENSITY	9018.125	34.	265.239	2.438
CONSTANCY X TIME X FREQUENCY	8401.938	68.	123.558	1.136
TIME X WAVEFORM X INTENSITY	4426.875	34.	130.202	1.197
TIME X WAVEFORM X FREQUENCY	8130.563	68.	119.567	1.099
TIME X INTENSITY X FREQUENCY	14203.875	136.	104.440	0.960
CONSTANCY X TIME X WAVEFORM X INTENSITY	4578.125	34.	134.651	1.238
CONSTANCY X TIME X WAVEFORM X FREQUENCY	6360.813	68.	93.541	0.860
CONSTANCY X TIME X INTENSITY X FREQUENCY	13895.750	136.	102.175	0.939
TIME X WAVEFORM X INTENSITY X FREQUENCY	15073.125	136.	110.832	1.019
CONSTANCY X TIME X WAVEFORM X INTENSITY X FREQUENCY	12853.375	136.	94.510	0.869
ERROR TERM	554876.250	5100.	108.799	

TABLE 33. MEANS - RELATIVE AMPLITUDE OF JUMPS BY SHOCK PRESENTATION

				E1--------------E9
D1	C1	B1	A1	26.20.18.23.24.24.34.34.33.
			A2	0. 6. 3.12. 5.11. 9.13.13.
		B2	A1	28.29.27.25.29.32.25.31.27.
			A2	3. 9.13. 5. 9. 6. 0.12.14.
	C2	B1	A1	33.35.36.34.37.18.29.29.36.
			A2	20.20.22.27.23.33.28.30.34.
		B2	A1	34.36.36.34.36.30.33.34.36.
			A2	13.17.14.16.27.21.23.24.28.
	C3	B1	A1	41.40.36.33.25.33.23.25.16.
			A2	37.36.35.41.36.34.36.34.30.
		B2	A1	37.35.40.35.33.32.31.37.31.
			A2	34.35.33.36.33.29.29.32.30.
D2	C1	B1	A1	21.21.25.22.23.27.26.26.25.
			A2	0. 6. 0. 0. 5. 0. 0. 3. 3.
		B2	A1	27.25.32.38.29.34.31.33.36.
			A2	26.16.24.21.16.17.16.25.19.
	C2	B1	A1	25.30.31.42.32.24.28.32.31.
			A2	24.24.26.33.32.29.31.28.31.
		B2	A1	33.36.36.40.34.30.34.20.34.
			A2	20.19.20.24.24.30.28.31.28.
	C3	B1	A1	37.33.33.29.32.22.21.19.18.
			A2	34.32.34.32.33.20.24.26.18.
		B2	A1	27.24.23.25.25.21.26.28.29.
			A2	31.13.25.34.32.24.23.20.23.
D3	C1	B1	A1	26.31.29.34.25.25.31.30.30.
			A2	3.13.10.31.24.15.24.16.14.
		B2	A1	35.35.34.35.36.34.35.33.34.
			A2	15.27.27.23.27.24.25.27.31.
	C2	B1	A1	21.26.32.28.29.30.29.30.32.
			A2	13.23.18.23.24.25.24.20.18.
		B2	A1	35.34.35.35.35.31.36.30.31.
			A2	25.31.30.32.32.28.31.34.30.
	C3	B1	A1	35.34.35.30.29.32.32.28.20.
			A2	31.33.26.31.30.30.25.20.21.
		B2	A1	32.32.29.27.26.25.25.22.20.
			A2	40.28.31.28.28.26.24.22.23.
D4	C1	B1	A1	25.34.33.36.32.32.33.36.34.
			A2	17.13. 9.14.14.13.12.11.10.
		B2	A1	30.35.37.34.30.36.34.33.35.
			A2	26.21.25.25.23.26.24.23.26.
	C2	B1	A1	34.31.31.27.32.27.24.30.26.
			A2	21.20.30.34.30.27.24.33.40.
		B2	A1	35.36.34.36.33.25.31.20.33.
			A2	25.25.26.27.26.29.27.33.35.
	C3	B1	A1	34.35.36.38.35.35.35.34.32.
			A2	33.35.31.33.34.21.31.29.22.
		B2	A1	33.33.33.37.27.24.26.19.16.
			A2	34.35.31.25.29.27.34.29.26.
D5	C1	B1	A1	32.34.35.34.34.39.34.33.37.
			A2	25.22.26.22.26.24.26.18.24.
		B2	A1	32.37.36.38.37.35.40.34.38.
			A2	28.22.25.28.26.28.21.25.25.
	C2	B1	A1	35.43.35.40.41.35.40.37.37.
			A2	33.35.37.38.34.35.35.30.35.
		B2	A1	37.38.37.36.37.38.34.38.36.
			A2	24.21.24.23.27.27.23.27.21.
	C3	B1	A1	31.33.33.40.35.32.31.24.34.
			A2	35.32.35.33.36.37.35.33.31.
		B2	A1	33.35.35.36.36.33.35.33.34.
			A2	36.37.35.32.33.37.34.32.29.

TABLE 34. ANALYSIS OF VARIANCE - RELATIVE AMPLITUDE OF JUMPS BY SHOCK PRESENTATION

Source											SS	df	MS	F
										BETWEEN SUBJECTS	367625.563	359.		
										CONSTANCY	37849.844	1.	37849.844	55.898
										WAVEFORM	1565.281	1.	1565.281	2.312
										INTENSITY	27665.000	2.	13832.500	20.428
										FREQUENCY	18930.375	4.	4732.594	6.989
								CONSTANCY	X	WAVEFORM	30.813	1.	30.813	0.046
								CONSTANCY	X	INTENSITY	30695.906	2.	15347.953	22.667
								CONSTANCY	X	FREQUENCY	1784.313	4.	446.078	0.659
								WAVEFORM	X	INTENSITY	6481.906	2.	3240.953	4.786
								WAVEFORM	X	FREQUENCY	3290.781	4.	822.695	1.215
								INTENSITY	X	FREQUENCY	15794.688	8.	1974.336	2.916
						CONSTANCY	X	WAVEFORM	X	INTENSITY	2466.750	2.	1233.375	1.822
						CONSTANCY	X	WAVEFORM	X	FREQUENCY	4099.188	4.	1024.797	1.513
						CONSTANCY	X	INTENSITY	X	FREQUENCY	4951.594	8.	618.949	0.914
						WAVEFORM	X	INTENSITY	X	FREQUENCY	7338.219	8.	917.277	1.355
				CONSTANCY	X	WAVEFORM	X	INTENSITY	X	FREQUENCY	1544.969	8.	193.121	0.285
										ERROR TERM	203135.906	300.	677.120	
										WITHIN SUBJECTS	211791.563	2880.		
										TIME	1633.344	8.	204.168	2.929
								CONSTANCY	X	TIME	1061.313	8.	132.664	1.903
								TIME	X	WAVEFORM	472.531	8.	59.066	0.847
								TIME	X	INTENSITY	9811.500	16.	613.219	8.797
								TIME	X	FREQUENCY	2304.469	32.	72.015	1.033
						CONSTANCY	X	TIME	X	WAVEFORM	984.156	8.	123.020	1.765
						CONSTANCY	X	TIME	X	INTENSITY	2074.250	16.	129.641	1.860
						CONSTANCY	X	TIME	X	FREQUENCY	2404.625	32.	75.145	1.078
						TIME	X	WAVEFORM	X	INTENSITY	1074.875	16.	67.180	0.964
						TIME	X	WAVEFORM	X	FREQUENCY	2800.000	32.	87.500	1.255
						TIME	X	INTENSITY	X	FREQUENCY	5164.906	64.	80.702	1.158
				CONSTANCY	X	TIME	X	WAVEFORM	X	INTENSITY	1127.688	16.	70.480	1.011
				CONSTANCY	X	TIME	X	WAVEFORM	X	FREQUENCY	1634.875	32.	51.090	0.733
				CONSTANCY	X	TIME	X	INTENSITY	X	FREQUENCY	4573.219	64.	71.457	1.025
				TIME	X	WAVEFORM	X	INTENSITY	X	FREQUENCY	3975.406	64.	62.116	0.891
		CONSTANCY	X	TIME	X	WAVEFORM	X	INTENSITY	X	FREQUENCY	3389.031	64.	52.954	0.760
										ERROR TERM	167295.438	2400.	69.706	

TABLE 35. MEANS - NUMBER OF JUMPS BY QUARTER SHOCK PRESENTATION

E1-----------------E[illegible]

D1	C1	B1	A1	0.	3.	1.	1.	1.	1.	1.	1.	2.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	2.	1.	2.	1.	2.	1.	2.	2.	2.	1.	1.	2.	2.	2.	2.
			A2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.	1.	1.	0.	0.	1.	0.	1.	0.	0.	1.	0.	0.	0.
		B2	A1	1.	1.	1.	2.	2.	1.	1.	1.	1.	2.	2.	1.	2.	1.	2.	2.	2.	2.	2.	2.	2.	3.	2.	2.	3.	2.	2.	2.	2.	2.	2.	1.	2.	2.	2.	2.
			A2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.
	C2	B1	A1	3.	5.	4.	3.	4.	5.	5.	4.	4.	5.	5.	4.	4.	5.	4.	4.	4.	4.	4.	5.	4.	5.	2.	4.	3.	5.	3.	4.	4.	4.	3.	3.	4.	4.	3.	2.
			A2	1.	0.	1.	0.	1.	1.	1.	2.	1.	2.	2.	1.	1.	1.	1.	2.	2.	2.	1.	1.	1.	2.	1.	2.	1.	2.	2.	1.	1.	1.	2.	2.	2.	1.	2.	2.
		B2	A1	4.	4.	3.	3.	4.	3.	5.	3.	3.	5.	3.	3.	3.	4.	4.	4.	4.	5.	4.	3.	3.	3.	2.	2.	3.	3.	3.	3.	4.	3.	2.	2.	3.	5.	2.	2.
			A2	1.	1.	0.	1.	1.	1.	1.	0.	1.	1.	1.	1.	1.	1.	1.	1.	1.	2.	1.	1.	2.	2.	1.	1.	1.	1.	1.	1.	1.	1.	2.	0.	1.	2.	2.	1.
	C3	B1	A1	5.	3.	4.	4.	4.	4.	3.	4.	3.	2.	2.	1.	3.	1.	1.	1.	2.	2.	1.	1.	1.	2.	1.	1.	2.	1.	1.	1.	1.	1.	0.	0.	1.	2.	1.	1.
			A2	3.	4.	3.	2.	4.	4.	4.	3.	4.	4.	3.	3.	4.	5.	3.	4.	3.	4.	2.	4.	3.	3.	2.	3.	3.	3.	2.	2.	4.	2.	2.	2.	3.	2.	2.	2.
		B2	A1	3.	4.	4.	4.	3.	4.	4.	3.	4.	4.	3.	2.	4.	4.	3.	2.	3.	3.	2.	2.	4.	4.	3.	2.	4.	3.	2.	2.	3.	4.	3.	2.	3.	3.	2.	1.
			A2	1.	3.	2.	3.	3.	3.	4.	2.	2.	3.	4.	3.	3.	3.	3.	4.	3.	2.	3.	3.	3.	3.	4.	2.	2.	3.	2.	2.	3.	4.	3.	2.	3.	3.	2.	1.
D2	C1	B1	A1	2.	2.	2.	2.	1.	3.	2.	1.	2.	3.	2.	1.	2.	2.	2.	2.	1.	2.	2.	2.	2.	2.	3.	2.	2.	2.	3.	2.	2.	2.	2.	2.	1.	3.	2.	1.
			A2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		B2	A1	1.	1.	1.	1.	3.	2.	2.	3.	2.	1.	2.	2.	2.	3.	2.	1.	2.	2.	1.	1.	2.	3.	2.	3.	2.	4.	1.	1.	3.	3.	2.	2.	2.	2.	3.	2.
			A2	1.	1.	1.	1.	1.	1.	1.	1.	2.	2.	1.	1.	1.	2.	2.	0.	1.	1.	1.	1.	1.	1.	1.	1.	1.	2.	1.	0.	1.	0.	1.	1.	1.	1.	1.	1.
	C2	B1	A1	2.	3.	2.	2.	4.	3.	3.	2.	3.	3.	4.	2.	3.	4.	3.	2.	3.	4.	3.	3.	3.	3.	3.	2.	4.	4.	2.	3.	4.	2.	4.	2.	3.	3.	3.	2.
			A2	2.	2.	1.	1.	2.	3.	1.	2.	2.	2.	1.	1.	2.	3.	2.	1.	2.	3.	2.	1.	2.	2.	2.	2.	2.	2.	2.	1.	4.	2.	3.	2.	3.	4.	2.	2.
		B2	A1	4.	4.	3.	3.	4.	4.	5.	4.	3.	4.	4.	4.	5.	3.	3.	2.	4.	5.	3.	3.	3.	4.	3.	2.	3.	3.	3.	2.	4.	3.	3.	2.	4.	4.	2.	3.
			A2	1.	1.	1.	1.	2.	1.	1.	1.	2.	2.	2.	2.	2.	1.	2.	2.	2.	1.	2.	2.	3.	2.	2.	1.	2.	3.	2.	1.	2.	2.	1.	2.	1.	3.	1.	1.
	C3	B1	A1	4.	3.	2.	2.	4.	3.	2.	2.	4.	2.	2.	2.	4.	2.	2.	2.	2.	2.	1.	1.	2.	2.	2.	1.	2.	2.	1.	2.	1.	2.	2.	1.	3.	2.	2.	3.
			A2	3.	3.	3.	2.	3.	4.	4.	3.	3.	4.	2.	2.	4.	3.	3.	2.	3.	2.	2.	1.	2.	2.	2.	1.	1.	2.	2.	1.	1.	1.	1.	1.	2.	3.	2.	1.
		B2	A1	2.	2.	2.	2.	1.	2.	1.	1.	2.	2.	1.	1.	1.	2.	1.	1.	2.	2.	1.	1.	2.	1.	1.	1.	2.	2.	2.	2.	1.	2.	2.	2.	2.	2.	1.	2.
			A2	0.	3.	4.	2.	3.	3.	3.	3.	3.	2.	2.	3.	3.	4.	4.	2.	2.	2.	3.	2.	2.	3.	2.	2.	2.	3.	2.	3.	1.	2.	1.	2.	1.	2.	1.	2.
D3	C1	B1	A1	2.	2.	1.	1.	3.	2.	2.	3.	2.	2.	2.	2.	3.	3.	2.	2.	3.	3.	3.	1.	2.	4.	3.	1.	3.	3.	2.	3.	2.	2.	2.	2.	2.	3.	2.	2.
			A2	0.	0.	0.	0.	0.	0.	0.	0.	1.	1.	0.	0.	1.	1.	1.	1.	1.	0.	1.	0.	1.	0.	1.	0.	1.	1.	0.	1.	0.	1.	1.	1.	1.	0.	1.	0.
		B2	A1	4.	4.	3.	4.	3.	5.	3.	3.	5.	6.	4.	2.	4.	5.	3.	4.	4.	5.	4.	3.	3.	3.	3.	2.	4.	4.	3.	3.	4.	4.	2.	1.	4.	3.	2.	3.
			A2	1.	1.	1.	2.	2.	2.	2.	1.	2.	2.	2.	2.	1.	2.	1.	1.	3.	2.	2.	1.	2.	2.	2.	0.	2.	3.	2.	1.	2.	2.	2.	2.	2.	2.	2.	1.
	C2	B1	A1	2.	3.	2.	1.	5.	3.	2.	2.	4.	5.	4.	3.	4.	4.	3.	3.	4.	3.	2.	2.	4.	2.	2.	3.	3.	3.	2.	1.	3.	3.	2.	2.	1.	3.	2.	2.
			A2	1.	0.	1.	1.	2.	1.	0.	1.	1.	2.	1.	2.	2.	2.	1.	1.	1.	2.	1.	1.	1.	1.	1.	0.	2.	2.	1.	1.	0.	1.	1.	1.	0.	1.	1.	1.
		B2	A1	3.	4.	4.	4.	5.	5.	4.	4.	4.	4.	3.	4.	4.	5.	4.	5.	5.	6.	3.	4.	5.	3.	2.	3.	3.	4.	3.	2.	3.	4.	2.	2.	3.	3.	3.	3.
			A2	3.	1.	2.	2.	3.	3.	2.	2.	3.	3.	2.	2.	2.	2.	2.	2.	2.	2.	3.	1.	2.	2.	2.	1.	2.	2.	2.	2.	2.	2.	1.	2.	3.	2.	2.	2.
	C3	B1	A1	4.	3.	3.	3.	3.	5.	4.	4.	4.	3.	2.	3.	3.	4.	3.	2.	4.	3.	2.	2.	3.	3.	3.	3.	3.	3.	3.	2.	3.	3.	2.	1.	2.	3.	2.	1.
			A2	2.	3.	3.	2.	4.	4.	2.	2.	3.	4.	2.	2.	4.	4.	3.	3.	3.	2.	2.	2.	3.	3.	1.	1.	2.	3.	1.	2.	2.	2.	1.	1.	2.	2.	2.	1.
		B2	A1	3.	3.	3.	4.	3.	3.	3.	2.	2.	4.	3.	2.	2.	3.	1.	2.	2.	2.	2.	2.	2.	2.	1.	0.	2.	2.	1.	1.	1.	1.	2.	1.	2.	1.	0.	1.
			A2	2.	5.	4.	4.	4.	4.	4.	4.	4.	3.	3.	3.	3.	3.	3.	3.	3.	4.	4.	2.	3.	2.	3.	2.	2.	2.	3.	3.	3.	3.	3.	2.	2.	3.	3.	2.
D4	C1	B1	A1	3.	2.	1.	2.	4.	3.	4.	3.	1.	1.	3.	1.	1.	3.	3.	2.	2.	4.	3.	3.	3.	3.	3.	3.	3.	2.	3.	3.	3.	3.	3.	2.	1.	3.	3.	2.
			A2	1.	0.	0.	0.	1.	1.	0.	0.	1.	0.	1.	1.	1.	1.	1.	1.	1.	1.	0.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	0.	1.	1.	0.
		B2	A1	2.	2.	3.	2.	4.	3.	2.	5.	4.	5.	1.	4.	3.	3.	4.	3.	5.	5.	4.	3.	3.	3.	2.	3.	3.	4.	4.	3.	4.	4.	3.	3.	4.	4.	2.	2.
			A2	2.	1.	1.	1.	1.	1.	1.	1.	2.	1.	1.	1.	1.	2.	1.	1.	2.	2.	2.	1.	1.	2.	1.	2.	1.	2.	1.	1.	2.	2.	3.	1.	2.	1.	1.	1.
	C2	B1	A1	2.	2.	2.	2.	2.	2.	3.	2.	2.	2.	2.	2.	1.	2.	2.	2.	2.	3.	3.	1.	1.	2.	2.	2.	2.	3.	3.	2.	2.	3.	2.	2.	2.	2.	2.	2.
			A2	1.	1.	1.	1.	1.	1.	1.	2.	2.	3.	2.	2.	3.	3.	3.	2.	3.	2.	2.	4.	4.	3.	3.	2.	3.	3.	2.	3.	3.	2.	2.	3.	2.	2.	2.	1.
		B2	A1	4.	5.	4.	3.	3.	5.	2.	2.	4.	3.	2.	3.	2.	4.	2.	3.	3.	2.	1.	2.	2.	1.	0.	1.	2.	2.	2.	1.	2.	2.	1.	1.	2.	2.	2.	1.
			A2	2.	1.	2.	1.	2.	3.	2.	1.	2.	3.	3.	2.	3.	2.	3.	2.	4.	3.	4.	2.	3.	2.	2.	2.	3.	3.	3.	3.	3.	2.	1.	3.	3.	2.	2.	1.
	C3	B1	A1	3.	3.	2.	4.	4.	4.	3.	2.	4.	5.	2.	2.	4.	3.	2.	2.	4.	4.	2.	1.	3.	2.	2.	3.	3.	3.	2.	1.	3.	2.	2.	2.	3.	4.	3.	2.
			A2	3.	4.	3.	3.	3.	4.	2.	3.	3.	3.	3.	3.	4.	4.	3.	2.	2.	2.	1.	2.	2.	3.	2.	2.	2.	3.	2.	2.	3.	3.	3.	2.	3.	3.	2.	1.
		B2	A1	3.	3.	2.	3.	3.	1.	3.	3.	3.	2.	2.	3.	4.	3.	3.	3.	2.	4.	3.	3.	2.	2.	1.	0.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	0.	0.
			A2	1.	3.	4.	4.	3.	4.	4.	3.	2.	3.	4.	3.	3.	3.	4.	3.	2.	3.	3.	2.	2.	3.	2.	3.	3.	3.	2.	2.	3.	3.	2.	2.	2.	3.	3.	2.
D5	C1	B1	A1	3.	3.	3.	2.	4.	4.	2.	3.	4.	4.	1.	2.	4.	5.	3.	3.	5.	4.	3.	3.	3.	3.	3.	3.	4.	5.	4.	3.	5.	3.	3.	2.	4.	4.	2.	3.
			A2	2.	1.	1.	0.	2.	3.	1.	2.	2.	2.	2.	2.	1.	2.	2.	1.	2.	2.	1.	1.	2.	2.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	2.	1.	1.
		B2	A1	4.	4.	4.	4.	5.	6.	4.	4.	5.	4.	5.	4.	5.	5.	5.	3.	5.	5.	4.	4.	4.	4.	3.	3.	4.	4.	4.	3.	5.	5.	3.	4.	4.	3.	3.	3.
			A2	2.	1.	1.	1.	1.	1.	1.	1.	2.	1.	3.	1.	2.	1.	2.	2.	2.	2.	1.	2.	3.	1.	1.	2.	2.	3.	1.	1.	1.	2.	2.	1.	1.	2.	1.	2.
	C2	B1	A1	4.	5.	4.	4.	4.	4.	4.	4.	4.	5.	4.	3.	5.	5.	3.	3.	4.	5.	5.	4.	3.	5.	3.	3.	4.	3.	3.	3.	3.	4.	3.	2.	4.	5.	3.	3.
			A2	2.	2.	1.	2.	2.	3.	3.	3.	2.	3.	3.	2.	3.	4.	3.	3.	3.	3.	3.	3.	4.	3.	2.	2.	3.	3.	3.	2.	3.	3.	2.	3.	3.	3.	3.	3.
		B2	A1	5.	5.	4.	4.	5.	5.	5.	6.	5.	7.	4.	4.	5.	5.	5.	4.	5.	6.	6.	4.	4.	5.	3.	3.	5.	7.	4.	4.	5.	6.	3.	3.	5.	4.	3.	4.
			A2	1.	2.	1.	1.	1.	1.	2.	2.	1.	2.	3.	3.	1.	2.	3.	2.	2.	2.	3.	1.	2.	3.	2.	2.	1.	1.	1.	2.	2.	1.	1.	2.	2.	2.	3.	2.
	C3	B1	A1	3.	4.	3.	3.	5.	4.	3.	3.	3.	2.	2.	2.	3.	3.	3.	1.	4.	3.	3.	3.	4.	4.	3.	2.	4.	3.	2.	3.	2.	2.	1.	0.	2.	3.	2.	1.
			A2	3.	2.	1.	2.	3.	3.	3.	4.	4.	3.	3.	3.	4.	4.	3.	2.	4.	5.	3.	3.	3.	3.	1.	2.	3.	2.	2.	2.	3.	2.	1.	2.	3.	2.	2.	1.
		B2	A1	3.	6.	2.	3.	5.	4.	4.	4.	4.	4.	3.	2.	3.	5.	4.	4.	3.	4.	3.	2.	2.	3.	3.	2.	3.	3.	3.	3.	4.	2.	3.	3.	4.	3.	2.	2.
			A2	3.	4.	4.	3.	4.	4.	4.	6.	6.	4.	5.	5.	1.	5.	5.	4.	3.	4.	4.	3.	2.	3.	6.	4.	3.	3.	5.	4.	3.	5.	3.	2.	3.	4.	4.	4.

TABLE 36. ANALYSIS OF VARIANCE - NUMBER OF JUMPS BY QUARTER SHOCK PRESENTATION

Source	SS	df	MS	F
BETWEEN SUBJECTS	28799.015	359.		
CONSTANCY	2827.068	1.	2827.068	52.449
WAVEFORM	260.951	1.	260.951	4.841
INTENSITY	1902.613	2.	951.306	17.649
FREQUENCY	1824.258	4.	456.065	8.461
CONSTANCY x WAVEFORM	0.458	1.	0.458	0.008
CONSTANCY x INTENSITY	2804.125	2.	1402.063	26.012
CONSTANCY x FREQUENCY	211.200	4.	52.800	0.980
WAVEFORM x INTENSITY	158.504	2.	79.252	1.470
WAVEFORM x FREQUENCY	179.604	4.	44.901	0.833
INTENSITY x FREQUENCY	728.047	8.	91.006	1.688
CONSTANCY x WAVEFORM x INTENSITY	102.667	2.	51.334	0.952
CONSTANCY x WAVEFORM x FREQUENCY	172.577	4.	43.144	0.800
CONSTANCY x INTENSITY x FREQUENCY	707.465	8.	88.433	1.641
WAVEFORM x INTENSITY x FREQUENCY	409.272	8.	51.159	0.949
CONSTANCY x WAVEFORM x INTENSITY x FREQUENCY	328.824	8.	41.103	0.763
ERROR TERM	16170.385	300.	53.901	
WITHIN SUBJECTS	28466.750	12600.		
TIME	1411.984	35.	40.342	19.769
CONSTANCY x TIME	350.018	35.	10.001	4.901
TIME x WAVEFORM	111.357	35.	3.182	1.559
TIME x INTENSITY	772.560	70.	11.037	5.408
TIME x FREQUENCY	317.286	140.	2.266	1.111
CONSTANCY x TIME x WAVEFORM	128.451	35.	3.670	1.798
CONSTANCY x TIME x INTENSITY	346.480	70.	4.950	2.425
CONSTANCY x TIME x FREQUENCY	295.812	140.	2.113	1.035
TIME x WAVEFORM x INTENSITY	248.647	70.	3.552	1.741
TIME x WAVEFORM x FREQUENCY	323.852	140.	2.313	1.134
TIME x INTENSITY x FREQUENCY	568.058	280.	2.029	0.994
CONSTANCY x TIME x WAVEFORM x INTENSITY	125.582	70.	1.794	0.879
CONSTANCY x TIME x WAVEFORM x FREQUENCY	262.278	140.	1.873	0.918
CONSTANCY x TIME x INTENSITY x FREQUENCY	637.208	280.	2.276	1.115
TIME x WAVEFORM x INTENSITY x FREQUENCY	621.357	280.	2.219	1.087
CONSTANCY x TIME x WAVEFORM x INTENSITY x FREQUENCY	518.370	280.	1.851	0.907
ERROR TERM	21427.449	10500.	2.041	

TABLE 37. MEANS - NUMBER OF JUMPS BY HALF SHOCK PRESENTATION

E1----------------E18

D1 C1 B1 A1	0.	7.	2.	2.	2.	2.	2.	1.	3.	1.	3.	3.	3.	3.	4.	2.	4.	3.
A2	0.	0.	0.	0.	0.	0.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	0.
B2 A1	2.	2.	3.	2.	4.	3.	3.	3.	4.	4.	5.	4.	4.	4.	4.	3.	4.	3.
A2	0.	0.	0.	0.	1.	0.	1.	1.	1.	0.	0.	0.	0.	0.	1.	1.	1.	1.
C2 B1 A1	8.	7.	9.	9.	8.	8.	9.	8.	8.	8.	9.	6.	7.	8.	7.	5.	7.	5.
A2	1.	1.	2.	2.	3.	3.	2.	3.	3.	2.	3.	3.	4.	3.	2.	4.	3.	4.
B2 A1	8.	6.	8.	6.	8.	5.	7.	8.	9.	7.	6.	4.	6.	6.	7.	3.	7.	4.
A2	1.	1.	2.	1.	2.	1.	2.	2.	3.	2.	3.	2.	2.	2.	2.	2.	3.	2.
C3 B1 A1	8.	8.	9.	6.	5.	4.	4.	2.	4.	3.	3.	2.	2.	1.	2.	0.	3.	1.
A2	6.	5.	8.	7.	8.	6.	8.	6.	6.	6.	5.	5.	6.	4.	6.	4.	5.	4.
B2 A1	7.	7.	7.	7.	7.	5.	7.	5.	6.	4.	7.	5.	6.	5.	6.	4.	6.	3.
A2	4.	5.	5.	6.	5.	7.	5.	7.	5.	6.	6.	6.	4.	5.	5.	3.	3.	4.
D2 C1 B1 A1	4.	4.	4.	4.	5.	3.	4.	4.	3.	4.	5.	4.	6.	4.	4.	3.	4.	4.
A2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B2 A1	3.	3.	6.	5.	5.	4.	5.	3.	5.	2.	5.	5.	6.	3.	6.	4.	3.	5.
A2	1.	1.	2.	1.	4.	2.	2.	2.	2.	2.	2.	2.	2.	1.	1.	2.	2.	1.
C2 B1 A1	5.	3.	7.	5.	6.	6.	7.	5.	7.	6.	6.	5.	7.	5.	6.	5.	6.	6.
A2	4.	2.	5.	3.	4.	2.	4.	3.	5.	1.	3.	3.	4.	4.	6.	5.	7.	5.
B2 A1	8.	6.	7.	8.	8.	8.	8.	5.	9.	6.	7.	5.	6.	5.	7.	5.	8.	6.
A2	2.	2.	3.	1.	4.	4.	4.	4.	3.	3.	5.	3.	4.	3.	4.	3.	4.	3.
C3 B1 A1	7.	4.	7.	4.	6.	4.	5.	4.	4.	2.	4.	3.	4.	2.	3.	3.	5.	4.
A2	6.	5.	6.	7.	7.	4.	7.	6.	4.	3.	5.	3.	3.	3.	3.	1.	4.	3.
B2 A1	4.	4.	3.	2.	4.	7.	3.	2.	4.	2.	3.	2.	5.	4.	3.	4.	4.	3.
A2	3.	8.	6.	6.	6.	5.	6.	6.	5.	5.	5.	4.	4.	5.	3.	3.	3.	3.
D3 C1 B1 A1	3.	2.	4.	4.	4.	4.	5.	3.	6.	4.	6.	4.	5.	4.	3.	4.	5.	4.
A2	0.	0.	1.	0.	1.	1.	2.	1.	2.	1.	1.	1.	1.	1.	1.	2.	1.	1.
B2 A1	8.	8.	7.	6.	10.	6.	9.	6.	9.	7.	6.	5.	8.	6.	7.	3.	7.	5.
A2	2.	7.	4.	3.	4.	4.	3.	2.	5.	3.	4.	2.	4.	3.	4.	3.	4.	3.
C2 B1 A1	5.	3.	8.	4.	4.	7.	8.	7.	6.	4.	6.	5.	6.	2.	6.	4.	4.	4.
A2	3.	2.	3.	3.	3.	2.	4.	2.	2.	2.	2.	2.	3.	2.	2.	2.	1.	1.
B2 A1	7.	8.	10.	7.	8.	7.	8.	8.	10.	7.	8.	4.	8.	5.	7.	5.	6.	5.
A2	4.	3.	6.	4.	5.	4.	4.	5.	4.	4.	3.	3.	4.	4.	4.	3.	5.	4.
C3 B1 A1	7.	6.	9.	7.	6.	5.	7.	4.	7.	4.	6.	5.	7.	5.	6.	3.	5.	3.
A2	5.	5.	8.	4.	7.	4.	7.	5.	5.	4.	5.	2.	5.	4.	4.	2.	4.	3.
B2 A1	6.	6.	6.	5.	6.	5.	4.	4.	4.	3.	4.	1.	4.	1.	2.	2.	3.	1.
A2	7.	8.	8.	8.	7.	6.	6.	6.	8.	6.	5.	5.	4.	5.	4.	5.	5.	5.
D4 C1 B1 A1	5.	3.	7.	7.	5.	5.	5.	5.	6.	6.	5.	5.	4.	5.	4.	5.	5.	5.
A2	1.	1.	2.	0.	1.	1.	1.	2.	2.	1.	5.	6.	5.	6.	6.	4.	6.	4.
B2 A1	4.	4.	7.	6.	9.	7.	6.	7.	10.	7.	1.	2.	2.	2.	2.	1.	2.	1.
A2	3.	1.	2.	2.	1.	1.	2.	2.	1.	3.	6.	4.	7.	6.	8.	6.	8.	4.
C2 B1 A1	5.	4.	4.	5.	4.	4.	3.	4.	5.	4.	1.	3.	3.	2.	3.	4.	3.	2.
A2	7.	1.	2.	2.	5.	4.	5.	5.	4.	4.	3.	4.	5.	5.	5.	4.	4.	4.
B2 A1	9.	7.	8.	5.	7.	5.	6.	5.	4.	4.	7.	5.	5.	5.	6.	5.	5.	4.
A2	3.	3.	4.	2.	6.	5.	5.	5.	6.	1.	4.	1.	4.	1.	3.	1.	3.	3.
C3 B1 A1	6.	6.	8.	4.	9.	4.	7.	4.	8.	5.	5.	3.	6.	6.	6.	4.	6.	6.
A2	7.	6.	8.	5.	5.	7.	9.	5.	5.	4.	5.	5.	6.	3.	5.	4.	6.	5.
B2 A1	6.	5.	7.	7.	7.	5.	7.	6.	6.	3.	5.	4.	5.	5.	6.	5.	7.	3.
A2	4.	7.	7.	7.	6.	7.	6.	7.	5.	6.	4.	1.	2.	2.	2.	1.	2.	0.
D5 C1 B1 A1	6.	6.	7.	5.	8.	6.	8.	7.	9.	5.	6.	5.	6.	5.	6.	4.	5.	5.
A2	3.	1.	4.	3.	4.	4.	5.	3.	3.	2.	6.	5.	9.	7.	8.	5.	8.	5.
B2 A1	8.	7.	11.	8.	4.	9.	4.	4.	10.	8.	3.	3.	2.	2.	2.	1.	3.	2.
A2	3.	1.	3.	2.	3.	4.	4.	3.	4.	2.	4.	6.	8.	7.	10.	8.	7.	7.
C2 B1 A1	8.	7.	8.	8.	4.	7.	10.	6.	4.	5.	4.	3.	5.	2.	3.	3.	3.	3.
A2	4.	3.	4.	6.	5.	4.	7.	6.	5.	5.	8.	6.	6.	6.	7.	5.	9.	6.
B2 A1	4.	7.	10.	11.	12.	8.	11.	9.	10.	10.	4.	6.	12.	8.	11.	5.	4.	7.
A2	4.	2.	1.	4.	4.	5.	4.	5.	3.	4.	5.	3.	2.	3.	3.	3.	3.	5.
C3 B1 A1	7.	6.	8.	5.	6.	4.	6.	3.	6.	6.	7.	5.	6.	5.	4.	2.	5.	3.
A2	5.	5.	6.	6.	7.	6.	8.	5.	9.	6.	6.	3.	5.	4.	5.	3.	5.	4.
B2 A1	4.	5.	4.	8.	7.	6.	4.	7.	7.	5.	5.	5.	6.	5.	6.	5.	7.	4.
A2	7.	7.	9.	10.	10.	10.	4.	10.	7.	7.	5.	10.	6.	9.	8.	7.	6.	8.

TABLE 38. ANALYSIS OF VARIANCE - NUMBER OF JUMPS BY HALF SHOCK PRESENTATION

BETWEEN SUBJECTS	57576.030	359.		
CONSTANCY	5654.136	1.	5654.136	52.449
WAVEFORM	521.901	1.	521.901	4.841
INTENSITY	3805.226	2.	1902.613	17.649
FREQUENCY	3648.517	4.	912.129	8.461
CONSTANCY x WAVEFORM	0.915	1.	0.915	0.008
CONSTANCY x INTENSITY	5608.251	2.	2804.125	26.012
CONSTANCY x FREQUENCY	422.399	4.	105.600	0.980
WAVEFORM x INTENSITY	317.009	2.	158.504	1.470
WAVEFORM x FREQUENCY	359.208	4.	89.802	0.833
INTENSITY x FREQUENCY	1456.095	8.	182.012	1.688
CONSTANCY x WAVEFORM x INTENSITY	205.335	2.	102.667	0.952
CONSTANCY x WAVEFORM x FREQUENCY	345.153	4.	86.288	0.800
CONSTANCY x INTENSITY x FREQUENCY	1414.931	8.	176.866	1.641
WAVEFORM x INTENSITY x FREQUENCY	818.544	8.	102.318	0.949
CONSTANCY x WAVEFORM x INTENSITY x FREQUENCY	657.647	8.	82.206	0.763
ERROR TERM	32340.770	300.	107.803	
WITHIN SUBJECTS	35264.500	6120.		
TIME	2574.549	17.	151.444	30.932
CONSTANCY x TIME	653.773	17.	38.457	7.855
TIME x WAVEFORM	159.607	17.	9.389	1.918
TIME x INTENSITY	1329.830	34.	39.113	7.989
TIME x FREQUENCY	380.979	68.	5.603	1.144
CONSTANCY x TIME x WAVEFORM	178.104	17.	10.477	2.140
CONSTANCY x TIME x INTENSITY	529.549	34.	15.575	3.181
CONSTANCY x TIME x FREQUENCY	409.316	68.	6.019	1.229
TIME x WAVEFORM x INTENSITY	358.026	34.	10.530	2.151
TIME x WAVEFORM x FREQUENCY	388.909	68.	5.719	1.168
TIME x INTENSITY x FREQUENCY	642.712	136.	4.726	0.965
CONSTANCY x TIME x WAVEFORM x INTENSITY	164.091	34.	4.826	0.986
CONSTANCY x TIME x WAVEFORM x FREQUENCY	346.897	68.	5.101	1.042
CONSTANCY x TIME x INTENSITY x FREQUENCY	821.854	136.	6.043	1.234
TIME x WAVEFORM x INTENSITY x FREQUENCY	733.007	136.	5.390	1.101
CONSTANCY x TIME x WAVEFORM x INTENSITY x FREQUENCY	603.575	136.	4.438	0.904
ERROR TERM	24969.730	5100.	4.896	

TABLE 39. MEANS - NUMBER OF JUMPS BY SHOCK PRESENTATION

				E1								E9
D1	C1	B1	A1	2.	3.	4.	4.	4.	6.	6.	6.	7.
			A2	0.	0.	0.	1.	1.	1.	2.	1.	1.
		B2	A1	4.	5.	7.	6.	8.	8.	8.	7.	8.
			A2	0.	0.	1.	1.	1.	0.	0.	1.	1.
	C2	B1	A1	15.	18.	17.	17.	16.	15.	15.	13.	12.
			A2	2.	4.	6.	5.	5.	6.	7.	6.	7.
		B2	A1	14.	16.	13.	15.	16.	10.	12.	10.	12.
			A2	2.	4.	3.	3.	4.	5.	4.	4.	5.
	C3	B1	A1	15.	15.	9.	6.	7.	5.	4.	2.	4.
			A2	11.	14.	13.	15.	12.	10.	10.	10.	9.
		B2	A1	14.	14.	13.	12.	11.	12.	11.	11.	5.
			A2	5.	11.	12.	12.	11.	12.	9.	8.	7.
D2	C1	B1	A1	7.	8.	8.	6.	7.	9.	9.	7.	8.
			A2	0.	0.	0.	0.	0.	0.	0.	0.	0.
		B2	A1	5.	10.	4.	8.	7.	10.	8.	9.	8.
			A2	3.	3.	4.	5.	4.	4.	3.	3.	3.
	C2	B1	A1	8.	12.	12.	12.	13.	12.	12.	11.	12.
			A2	6.	7.	6.	7.	8.	8.	8.	10.	11.
		B2	A1	14.	16.	18.	13.	14.	12.	12.	12.	13.
			A2	4.	4.	4.	7.	6.	8.	7.	7.	6.
	C3	B1	A1	11.	11.	13.	4.	6.	7.	6.	6.	4.
			A2	10.	13.	11.	12.	7.	7.	6.	4.	7.
		B2	A1	8.	5.	6.	5.	5.	4.	8.	7.	7.
			A2	4.	12.	11.	12.	4.	8.	4.	6.	6.
D3	C1	B1	A1	5.	6.	4.	4.	10.	10.	4.	7.	8.
			A2	1.	1.	2.	3.	2.	2.	2.	2.	2.
		B2	A1	15.	13.	17.	15.	16.	11.	14.	16.	12.
			A2	4.	7.	8.	5.	8.	5.	8.	7.	7.
	C2	B1	A1	8.	[illegible]	15.	14.	[illegible]	11.	8.	9.	8.
			A2	2.	4.	5.	6.	4.	4.	5.	3.	2.
		B2	A1	16.	17.	15.	16.	17.	12.	13.	11.	11.
			A2	7.	5.	5.	5.	8.	6.	7.	7.	10.
	C3	B1	A1	13.	16.	11.	11.	11.	11.	11.	8.	8.
			A2	9.	13.	11.	12.	9.	7.	4.	6.	7.
		B2	A1	12.	11.	11.	8.	7.	5.	5.	5.	4.
			A2	15.	16.	13.	12.	14.	9.	9.	9.	9.
D4	C1	B1	A1	8.	13.	10.	10.	12.	11.	11.	10.	10.
			A2	2.	2.	2.	3.	3.	3.	4.	3.	2.
		B2	A1	9.	14.	16.	13.	17.	10.	13.	14.	12.
			A2	4.	4.	5.	4.	6.	6.	5.	7.	5.
	C2	B1	A1	6.	5.	5.	7.	5.	7.	10.	9.	9.
			A2	4.	5.	10.	10.	5.	13.	10.	10.	8.
		B2	A1	16.	12.	17.	11.	7.	5.	7.	4.	6.
			A2	6.	8.	11.	10.	11.	6.	12.	4.	12.
	C3	B1	A1	12.	12.	12.	11.	11.	10.	4.	9.	11.
			A2	14.	17.	12.	14.	6.	8.	10.	11.	9.
		B2	A1	11.	13.	12.	13.	11.	5.	4.	3.	2.
			A2	11.	14.	12.	13.	5.	9.	10.	10.	10.
D5	C1	B1	A1	12.	13.	14.	15.	14.	11.	15.	13.	13.
			A2	4.	7.	6.	6.	5.	6.	4.	3.	5.
		B2	A1	16.	19.	17.	17.	17.	15.	15.	17.	14.
			A2	4.	4.	6.	6.	6.	7.	6.	6.	5.
	C2	B1	A1	15.	16.	16.	16.	17.	14.	12.	12.	15.
			A2	7.	10.	9.	13.	10.	11.	11.	10.	12.
		B2	A1	16.	21.	19.	20.	20.	15.	20.	16.	15.
			A2	5.	6.	8.	8.	7.	8.	5.	6.	8.
	C3	B1	A1	13.	14.	10.	4.	12.	12.	11.	6.	8.
			A2	8.	12.	13.	13.	15.	9.	9.	8.	9.
		B2	A1	14.	17.	13.	15.	12.	10.	11.	11.	11.
			A2	13.	18.	20.	16.	14.	15.	14.	15.	14.

TABLE 40. ANALYSIS OF VARIANCE - NUMBER OF JUMPS BY SHOCK PRESENTATION

BETWEEN SUBJECTS	115152.061	359.		
CONSTANCY	11308.271	1.	11308.271	52.449
WAVEFORM	1043.803	1.	1043.803	4.841
INTENSITY	7610.451	2.	3805.226	17.649
FREQUENCY	7297.033	4.	1824.258	8.461
CONSTANCY x WAVEFORM	1.830	1.	1.830	0.008
CONSTANCY x INTENSITY	11216.502	2.	5608.251	26.012
CONSTANCY x FREQUENCY	844.799	4.	211.200	0.980
WAVEFORM x INTENSITY	634.018	2.	317.009	1.470
WAVEFORM x FREQUENCY	718.416	4.	179.604	0.833
INTENSITY x FREQUENCY	2912.189	8.	364.024	1.688
CONSTANCY x WAVEFORM x INTENSITY	410.670	2.	205.335	0.952
CONSTANCY x WAVEFORM x FREQUENCY	690.307	4.	172.577	0.800
CONSTANCY x INTENSITY x FREQUENCY	2829.861	8.	353.733	1.641
WAVEFORM x INTENSITY x FREQUENCY	1637.088	8.	204.636	0.949
CONSTANCY x WAVEFORM x INTENSITY x FREQUENCY	1315.295	8.	164.412	0.763
ERROR TERM	64681.539	300.	215.605	
WITHIN SUBJECTS	42404.000	2880.		
TIME	2177.523	8.	272.190	21.809
CONSTANCY x TIME	700.602	8.	87.575	7.017
TIME x WAVEFORM	173.395	8.	21.674	1.737
TIME x INTENSITY	2499.676	16.	156.230	12.518
TIME x FREQUENCY	445.266	32.	13.915	1.115
CONSTANCY x TIME x WAVEFORM	163.625	8.	20.453	1.639
CONSTANCY x TIME x INTENSITY	922.289	16.	57.643	4.619
CONSTANCY x TIME x FREQUENCY	495.762	32.	15.493	1.241
TIME x WAVEFORM x INTENSITY	270.178	16.	16.886	1.353
TIME x WAVEFORM x FREQUENCY	523.318	32.	16.354	1.310
TIME x INTENSITY x FREQUENCY	689.803	64.	10.778	0.864
CONSTANCY x TIME x WAVEFORM x INTENSITY	117.139	16.	7.321	0.587
CONSTANCY x TIME x WAVEFORM x FREQUENCY	470.830	32.	14.713	1.179
CONSTANCY x TIME x INTENSITY x FREQUENCY	1147.135	64.	17.924	1.436
TIME x WAVEFORM x INTENSITY x FREQUENCY	953.506	64.	14.899	1.194
CONSTANCY x TIME x WAVEFORM x INTENSITY x FREQUENCY	700.002	64.	10.938	0.876
ERROR TERM	29953.961	2400.	12.481	

APPENDIX F

Summaries of the means and of the analyses of variance of response acquisition measures (collapsed over frequency).

Parameter identification key:

Constancy

A1 - Constant current
A2 - Constant voltage

Waveform

B1 - Sine wave
B2 - Square wave

Intensity

C1 - 5 db
C2 - 10 db
C3 - 15 db

TABLE 1. MEANS - MOVEMENT IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
C1	158.2767	184.1400	165.6467	132.6400
C2	165.5000	172.6200	144.0833	132.7233
C3	155.0233	144.5367	137.9067	151.7200

TABLE 2. ANALYSIS OF VARIANCE - MOVEMENT IN BLACK

SOURCE	MS	DF	F
CONST (A)	173.875	1.	0.105
MV-FRM (B)	33291.125	1.	20.0[illegible]8
INTER (C)	4982.063	2.	2.999
A X B	7024.250	1.	4.228
A X C	213.313	2.	0.128
B X C	5124.875	2.	3.085
A X B X C	12979.188	2.	7.812
ERROR	1661.360	348.	

TABLE 3. MEANS - FREEZING IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
C1	141.7233	115.8400	134.3533	167.3600
C2	134.5000	127.3800	155.9167	167.2767
C3	144.9767	155.4633	162.0533	148.2800

TABLE 4. ANALYSIS OF VARIANCE - FREEZING IN BLACK

SOURCE	MS	DF	F
CONST (A)	173.875	1.	0.105
MV-FRM (B)	33291.125	1.	20.038
INTER (C)	4981.969	2.	2.999
A X B	7024.063	1.	4.228
A X C	213.344	2.	0.128
B X C	5124.938	2.	3.085
A X B X C	12979.250	2.	7.812
ERROR	1661.362	348.	

TABLE 5. MEANS - MOVEMENT IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
C1	68.6533	141.0200	56.5167	69.0467
C2	73.0033	97.8733	65.7067	55.2467
C3	66.8200	57.4067	65.4633	55.7933

TABLE 6. ANALYSIS OF VARIANCE - MOVEMENT IN WHITE

SOURCE	MS	DF	F
CONST (A)	14527.781	1.	4.378
MV-FRM (B)	44227.500	1.	13.327
INTER (C)	15180.570	2.	4.574
A X B	24709.719	1.	7.446
A X C	21536.047	2.	6.490
B X C	12357.250	2.	3.724
A X B X C	6872.656	2.	2.071
ERROR	3318.581	348.	

TABLE 7. MEANS - FREEZING IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
C1	231.3466	158.9800	243.4833	230.5533
C2	228.9967	202.1267	230.2933	244.7533
C3	233.1800	242.5533	234.5366	244.2067

TABLE 8. ANALYSIS OF VARIANCE - FREEZING IN WHITE

SOURCE	MS	DF	F
CONST (A)	14550.000	1.	4.384
MV-FRM (B)	44250.250	1.	13.334
INTER (C)	15192.125	2.	4.578
A X B	24687.750	1.	7.439
A X C	21524.875	2.	6.486
B X C	12345.875	2.	3.720
A X B X C	6883.625	2.	2.074
ERROR	3318.550	348.	

TABLE 9. MEANS - NO. MOVEMENTS IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
C1	10.2333	9.1667	5.6000	11.1333
C2	11.4667	9.6667	11.1333	11.1333
C3	11.5667	11.1667	12.0333	11.2667

TABLE 10. ANALYSIS OF VARIANCE - NO. MOVEMENTS IN BLACK

SOURCE	MS	DF	F
CONST (A)	15.625	1.	2.730
BV-FRP (B)	23.002	1.	4.019
INTER (C)	65.519	2.	11.448
A X B	40.669	1.	7.106
A X C	10.258	2.	1.792
B X C	1.186	2.	0.207
A X B X C	17.669	2.	3.087
ERROR	5.723	348.	

TABLE 11. MEANS - NO. FREEZING IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
C1	9.2333	8.2000	8.6000	10.1333
C2	10.4667	8.6667	10.1333	10.1333
C3	10.5667	10.2000	11.0667	10.2667

TABLE 12. ANALYSIS OF VARIANCE - NO. FREEZING IN BLACK

SOURCE	MS	DF	F
CONST (A)	15.211	1.	2.647
BV-FRP (B)	22.500	1.	3.915
INTER (C)	66.186	2.	11.518
A X B	38.678	1.	6.731
A X C	10.586	2.	1.842
B X C	1.108	2.	0.193
A X B X C	18.219	2.	3.170
ERROR	5.747	348.	

TABLE 13. MEANS - NO. MOVEMENTS IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
C1	6.2333	7.4667	5.4333	5.8667
C2	6.2667	6.7333	6.1333	5.0667
C3	6.4333	6.4000	5.6333	5.5000

TABLE 14. ANALYSIS OF VARIANCE - NO. MOVEMENTS IN WHITE

SOURCE	MS	DF	F
CONST (A)	1.225	1.	0.095
BV-FRP (B)	81.225	1.	6.331
INTER (C)	2.019	2.	0.157
A X B	17.336	1.	1.351
A X C	12.308	2.	0.959
B X C	1.425	2.	0.111
A X B X C	5.036	2.	0.393
ERROR	12.830	348.	

TABLE 15. MEANS - NO. FREEZING IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
C1	5.9333	6.9333	5.2000	5.5667
C2	6.1000	6.2000	6.1333	4.8667
C3	6.1333	6.2333	5.2000	5.2333

TABLE 16. ANALYSIS OF VARIANCE - NO. FREEZING IN WHITE

SOURCE	MS	DF	F
CONST (A)	0.278	1.	0.024
BV-FRP (B)	71.111	1.	6.075
INTER (C)	1.319	2.	0.113
A X B	10.678	1.	0.912
A X C	12.036	2.	1.028
B X C	1.336	2.	0.114
A X B X C	3.186	2.	0.272
ERROR	11.705	348.	

TABLE 17. MEANS - TOTAL-FREEZING

	A1 B1	A2 B1	A1 B2	A2 B2
C1	373.0700	274.8400	377.8366	398.3133
C2	341.4566	329.5066	386.2100	412.0300
C3	378.1566	398.0566	396.6300	392.4866

TABLE 18. ANALYSIS OF VARIANCE - TOTAL-FREEZING

SOURCE	MS	DF	F
CONST (A)	11690.000	1.	1.743
RV-FRP (B)	154304.500	1.	23.008
INTER (C)	37530.750	2.	5.596
A x B	58048.000	1.	8.656
A x C	17900.000	2.	2.669
B x C	28267.000	2.	4.215
A x B x C	38517.750	2.	5.743
ERROR	6706.471	348.	

TABLE 19. MEANS - MEAN MOVEMENT IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
C1	16.2800	27.1133	22.8067	12.5000
C2	15.3533	22.7567	13.5167	12.8700
C3	14.0200	13.9467	12.0000	14.5767

TABLE 20. ANALYSIS OF VARIANCE - MEAN MOVEMENT IN BLACK

SOURCE	MS	DF	F
CONST (A)	241.559	1.	1.492
RV-FRP (B)	1127.995	1.	6.969
INTER (C)	1105.090	2.	6.828
A x B	1766.091	1.	10.912
A x C	76.990	2.	0.476
B x C	207.385	2.	1.281
A x B x C	1064.593	2.	6.578
ERROR	161.849	348.	

TABLE 21. MEANS - MEAN FREEZING IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
C1	15.4200	13.7333	16.7233	16.9333
C2	12.5533	14.4133	15.8467	16.9600
C3	13.9400	15.7600	14.9233	14.8767

TABLE 22. ANALYSIS OF VARIANCE - MEAN FREEZING IN BLACK

SOURCE	MS	DF	F
CONST (A)	20.135	1.	1.156
RV-FRP (B)	250.279	1.	14.366
INTER (C)	22.817	2.	1.310
A x B	0.080	1.	0.005
A x C	33.969	2.	1.950
B x C	60.298	2.	3.461
A x B x C	26.869	2.	1.542
ERROR	17.422	348.	

TABLE 23. MEANS - MEAN MOVEMENT IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
C1	12.1067	22.7767	12.5633	17.9133
C2	12.6233	15.7633	13.1367	11.2267
C3	10.1400	9.2433	10.3267	8.8733

TABLE 24. ANALYSIS OF VARIANCE - MEAN MOVEMENT IN WHITE

SOURCE	MS	DF	F
CONST (A)	242.637	1.	1.830
RV-FRP (B)	459.990	1.	3.469
INTER (C)	912.411	2.	6.881
A x B	630.092	1.	4.752
A x C	356.343	2.	2.687
B x C	159.135	2.	1.200
A x B x C	177.273	2.	1.337
ERROR	132.596	348.	

TABLE 25. MEANS - MEAN FREEZING IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
C1	71.0400	34.7267	86.2C33	75.1467
C2	55.5233	67.55C0	64.1633	83.4633
C3	67.7567	62.0133	111.6733	86.6967

TABLE 26. ANALYSIS OF VARIANCE - MEAN FREEZING IN WHITE

SOURCE	MS	DF	F
CONST (A)	5479.078	1.	0.914
SV-FRP (B)	55279.406	1.	9.219
INTER (C)	8808.250	2.	1.469
A X B	442.016	1.	0.074
A X C	12903.406	2.	2.152
B X C	3833.477	2.	0.639
A X B X C	375C.922	2.	0.626
ERROR	5996.303	348.	

APPENDIX G

Summaries of the means and of the analyses of variance of retention test one measures:

Parameter identification key:

Constancy

A1 - Constant current
A2 - Constant voltage

Waveform

B1 - Sine wave
B2 - Square wave

Intensity

C1 - 5 db
C2 - 10 db
C3 - 15 db

Frequency

D1 - 60 Hz
D2 - 120 Hz
D3 - 240 Hz
D4 - 480 Hz
D5 - 960 Hz

TABLE 1. MEANS - MOVEMENT IN BLACK

		A1 B1	A2 B1	A1 B2	A2 B2
B1	C1	379.9000	565.2833	247.7833	362.1333
	C2	175.3500	426.2167	279.1333	369.0833
	C3	245.9167	187.0167	121.0333	291.8167
B2	C1	224.5500	592.8333	225.0500	289.6667
	C2	144.8500	419.9500	140.3333	189.8500
	C3	182.3167	400.7667	83.1167	155.4500
B3	C1	277.9500	298.3333	222.7500	341.3167
	C2	196.4167	334.5333	347.8333	121.3500
	C3	125.6000	232.4667	304.1833	191.6000
B4	C1	205.2500	419.4000	115.8500	261.9167
	C2	157.4333	521.7833	228.8167	284.7500
	C3	141.9500	108.8333	286.6833	267.7667
B5	C1	266.0000	256.8667	139.0333	182.3333
	C2	111.7333	313.6000	100.5000	220.5833
	C3	152.6500	351.0333	121.3167	158.3833

TABLE 2. ANALYSIS OF VARIANCE - MOVEMENT IN BLACK

SOURCE	MS	DF	F
CONST (A)	1002281.500	1.	25.976
MV-FRM (B)	311613.750	1.	8.076
INTEN (C)	234265.875	2.	6.071
FREQ (D)	102095.188	4.	2.646
A X B	294527.500	1.	7.633
A X C	50902.125	2.	1.319
A X D	67946.750	4.	1.761
B X C	68954.250	2.	1.787
B X D	68227.375	4.	1.768
C X D	40148.219	8.	1.040
A X B X C	72921.250	2.	1.890
A X B X D	33810.063	4.	0.876
A X C X D	32853.781	8.	0.851
B X C X D	38201.406	8.	0.990
A X B X C X D	35718.281	8.	0.926
ERROR	38585.535	300.	

TABLE 3. MEANS - FREEZING IN BLACK

		A1 B1	A2 B1	A1 B2	A2 B2
B1	C1	259.3833	142.1500	226.0000	296.6500
	C2	255.9667	497.5500	334.4667	334.3500
	C3	216.3333	49.1333	535.6500	303.9333
B2	C1	279.3167	279.1333	215.9833	187.2000
	C2	589.6833	127.1000	594.3167	208.7500
	C3	331.6500	458.3000	108.1667	61.5500
B3	C1	580.9333	142.3500	678.5667	353.9833
	C2	167.2833	57.5833	272.1500	356.8167
	C3	256.3000	333.0000	411.7000	373.9333
B4	C1	542.3167	115.9000	267.7667	282.9333
	C2	454.8500	195.6000	197.0167	362.3000
	C3	524.6333	283.7833	258.1500	275.2833
B5	C1	198.9667	299.9333	65.3333	356.1333
	C2	221.0000	155.7500	100.0167	477.5500
	C3	358.9167	204.7333	285.2000	381.8333

TABLE 4. ANALYSIS OF VARIANCE - FREEZING IN BLACK

SOURCE	MS	DF	F
CONST (A)	340594.000	1.	3.383
MV-FRM (B)	35744.000	1.	0.355
INTEN (C)	4939.375	2.	0.049
FREQ (D)	55651.125	4.	0.553
A X B	378520.500	1.	3.759
A X C	15522.750	2.	0.154
A X D	187483.813	4.	1.862
B X C	23543.250	2.	0.234
B X D	236273.875	4.	2.347
C X D	151515.063	8.	1.505
A X B X C	56268.000	2.	0.559
A X B X D	167675.563	4.	1.665
A X C X D	237421.438	8.	2.358
B X C X D	100914.594	8.	1.002
A X B X C X D	29589.438	8.	0.294
ERROR	100685.031	300.	

TABLE 5. MEANS - MOVEMENT IN WHITE

		A1 B1	A2 B1	A1 B2	A2 B2
B1	C1	409.0167	407.1667	331.7833	333.1000
	C2	315.0667	229.6333	324.1500	351.2167
	C3	426.6000	564.1500	212.0833	248.7667
B2	C1	406.2833	325.6500	257.7333	434.7500
	C2	153.2333	440.6333	231.0333	360.2833
	C3	269.3833	205.4667	426.8167	429.3667
B3	C1	196.3167	409.6833	110.3833	292.0333
	C2	255.6167	593.1167	321.4667	339.4167
	C3	309.8167	347.4833	248.6667	305.8833
B4	C1	97.1667	461.7167	396.2500	492.2000
	C2	319.0500	356.1167	407.1667	344.2167
	C3	156.8000	331.9667	297.2500	344.5833
B5	C1	432.0000	356.2500	551.3000	410.9667
	C2	454.6333	330.2333	389.3000	294.6333
	C3	314.8667	438.3667	392.2833	309.0667

TABLE 6. ANALYSIS OF VARIANCE - MOVEMENT IN WHITE

SOURCE	MS	DF	F
CONST (A)	359076.500	1.	7.158
MV-FRM (B)	11962.500	1.	0.238
INTEN (C)	39614.250	2.	0.790
FREQ (D)	45796.000	4.	0.913
A X B	114092.500	1.	2.274
A X C	23521.250	2.	0.469
A X D	145543.000	4.	2.901
B X C	299.250	2.	0.006
B X D	148655.125	4.	2.963
C X D	35207.563	8.	0.702
A X B X C	1798.000	2.	0.035
A X B X D	47155.375	4.	0.940
A X C X D	75222.375	8.	1.500
B X C X D	83702.000	8.	1.669
A X B X C X D	40234.625	8.	0.802
ERROR	50164.525	300.	

TABLE 7. MEANS - FREEZING IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
B1 C1	151.7000	85.4000	394.4333	208.1167
C2	453.6167	46.6000	262.2500	145.3500
C3	311.1500	399.7000	327.2333	355.4833
B2 C1	289.8500	49.0167	501.2333	288.3833
C2	312.2333	212.3167	234.3167	441.1167
C3	416.6500	135.4667	581.9000	553.4333
B3 C1	144.6000	185.2500	188.3000	212.6667
C2	580.6833	214.7667	257.5500	382.4167
C3	508.2833	287.0500	235.4500	328.5833
B4 C1	355.2667	202.9833	420.1333	162.9500
C2	268.6667	126.5000	367.0000	208.7333
C3	376.6167	475.4167	357.9167	311.9667
B5 C1	303.0333	286.9500	460.3333	250.5667
C2	412.6333	400.4167	610.1833	206.8333
C3	373.5667	205.8667	397.2000	350.7167

TABLE 8. ANLAYSIS OF VARIANCE - FREEZING IN WHITE

SOURCE	MS	DF	F
CONST (A)	981587.500	1.	11.094
UV-FRN (B)	204672.000	1.	2.313
INTEN (C)	346726.000	2.	3.919
FREQ (D)	94707.000	4.	1.070
A X B	57228.500	1.	0.647
A X C	71768.500	2.	0.811
A X D	19908.000	4.	0.225
B X C	73318.500	2.	0.829
B X D	155081.875	4.	1.753
C X D	80701.938	8.	0.912
A X B X C	100688.250	2.	1.138
A X B X D	143814.250	4.	1.625
A X C X D	88302.438	8.	0.998
B X C X D	47513.063	8.	0.537
A X B X C X D	52948.063	8.	0.598
ERROR	88475.201	300.	

TABLE 9. MEANS - NO. MOVEMENTS IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
B1 C1	21.5000	21.0000	12.5000	24.5000
C2	19.8333	27.6667	20.0000	26.8333
C3	16.5000	11.8333	10.6667	20.5000
B2 C1	18.0000	31.8333	11.3333	20.5000
C2	14.8333	20.0000	11.8333	13.8333
C3	14.3333	26.6667	7.8333	10.8333
B3 C1	18.0000	19.6667	15.3333	23.0000
C2	7.0000	23.0000	20.3333	12.0000
C3	8.3333	13.8333	24.6667	17.8333
B4 C1	21.0000	19.0000	12.5000	19.3333
C2	13.0000	21.6667	16.8333	19.5000
C3	17.1667	8.3333	16.1667	17.6667
B5 C1	22.3333	19.8333	9.6667	16.5000
C2	12.5000	21.5000	9.3333	16.8333
C3	14.3333	22.5000	11.8333	8.8333

TABLE 10. ANALYSIS OF VARIANCE - NO. MOVEMENTS IN BLACK

SOURCE	MS	DF	F
CONST (A)	1621.378	1.	12.736
UV-FRN (B)	457.878	1.	3.597
INTEN (C)	449.544	2.	3.531
FREQ (D)	148.185	4.	1.164
A X B	14.399	1.	0.113
A X C	147.078	2.	1.155
A X C	101.093	4.	0.794
B X C	137.778	2.	1.082
B X C	461.676	4.	3.626
C X C	110.801	8.	0.870
A X B X C	350.400	2.	2.752
A X B X D	258.352	4.	2.029
A X C X D	58.856	8.	0.462
B X C X D	67.951	8.	0.534
A X B X C X D	100.455	8.	0.789
ERROR	127.310	300.	

TABLE 11. MEANS - NO. FREEZING IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
B1 C1	11.8333	7.8333	9.0000	12.5000
C2	12.0000	19.5000	11.0000	17.3333
C3	11.5000	4.5000	7.5000	11.3333
B2 C1	12.1667	22.1667	8.0000	8.5000
C2	12.8333	8.6667	5.5000	6.6667
C3	9.6667	16.8333	2.3333	4.0000
B3 C1	12.6667	7.6667	12.8333	11.6667
C2	4.0000	5.0000	10.6667	8.1667
C3	5.5000	7.0000	16.0000	11.6667
B4 C1	17.6667	7.3333	7.0000	7.5000
C2	9.1667	9.1667	8.0000	11.6667
C3	14.5000	5.1667	10.3333	6.8333
B5 C1	13.5000	13.6667	2.1667	7.1667
C2	5.8333	10.3333	3.6667	10.8333
C3	6.6667	12.1667	6.3333	5.0000

TABLE 12. ANALYSIS OF VARIANCE - NO. FREEZING IN BLACK

SOURCE	MS	DF	F
CONST (A)	32.400	1.	0.347
UV-FRN (B)	306.178	1.	3.275
INTEN (C)	90.103	2.	0.964
FREQ (D)	85.313	4.	0.913
A X B	72.900	1.	0.780
A X C	80.275	2.	0.859
A X C	133.199	4.	1.425
B X C	112.469	2.	1.203
B X C	426.935	4.	4.567
C X D	112.117	8.	1.199
A X B X C	17.775	2.	0.190
A X B X D	97.310	4.	1.041
A X C X D	67.199	8.	0.719
B X C X D	39.018	8.	0.417
A X B X C X D	56.081	8.	0.600
ERROR	93.491	300.	

TABLE 13. MEANS - NO. MOVEMENTS IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
D1 C1	20.6667	21.0000	19.1667	23.3333
C2	22.1667	12.6667	20.1667	20.3333
C3	21.3333	26.0000	12.5000	18.0000
D2 C1	22.3333	16.6667	15.0000	27.5000
C2	8.3333	25.1667	16.8333	27.0000
C3	18.6667	15.1667	26.0000	27.3333
D3 C1	13.0000	23.6667	13.1667	20.6667
C2	23.0000	32.8333	20.3333	19.0000
C3	27.6667	18.1667	15.8333	18.0000
D4 C1	12.6667	22.5000	22.3333	24.1667
C2	21.0000	20.8333	28.6667	18.3333
C3	14.8333	15.5000	15.0000	23.0000
D5 C1	26.8333	23.8333	25.0000	22.8333
C2	29.8333	25.1667	22.8333	15.8333
C3	19.3333	21.1667	24.1667	16.3333

TABLE 14. ANALYSIS OF VARIANCE - NO. MOVEMENTS IN WHITE

SOURCE	MS	DF	F
CONST (A)	124.844	1.	0.793
MV-FRM (B)	2.178	1.	0.014
INTEN (C)	60.211	2.	0.382
FREQ (D)	95.574	4.	0.607
A X B	0.400	1.	0.003
A X C	137.645	2.	0.874
A X D	196.504	4.	1.248
B X C	40.345	2.	0.256
B X D	390.171	4.	2.478
C X D	115.284	8.	0.732
A X B X C	91.633	2.	0.582
A X B X D	107.573	4.	0.683
A X C X D	224.627	8.	1.427
B X C X D	118.140	8.	0.750
A X B X C X D	106.672	8.	0.677
ERROR	157.463	300.	

TABLE 15. MEANS - NO. FREEZING IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
D1 C1	11.5000	8.3333	16.1667	11.8333
C2	14.8333	4.8333	11.6667	11.0000
C3	16.8333	19.1667	5.6667	9.1667
D2 C1	16.3333	4.5000	12.3333	16.5000
C2	6.8333	14.1667	10.8333	20.1667
C3	14.3333	5.8333	20.8333	21.1667
D3 C1	8.0000	13.0000	11.5000	9.6667
C2	20.5000	15.1667	11.0000	15.8333
C3	25.5000	12.0000	11.6667	12.5000
D4 C1	10.3333	11.5000	17.1667	12.6667
C2	17.5000	8.5000	20.3333	10.8333
C3	12.8333	12.5000	13.8333	14.8333
D5 C1	18.3333	18.3333	18.0000	13.6667
C2	23.5000	14.6667	17.5000	10.5000
C3	14.0000	11.6667	18.8333	12.8333

TABLE 16. ANALYSIS OF VARIANCE - NO. FREEZING IN WHITE

SOURCE	MS	DF	F
CONST (A)	565.003	1.	4.752
MV-FRM (B)	36.735	1.	0.309
INTEN (C)	71.853	2.	0.604
FREQ (D)	140.398	4.	1.181
A X B	150.803	1.	1.268
A X C	6.886	2.	0.058
A X D	62.218	4.	0.523
B X C	37.870	2.	0.319
B X D	298.688	4.	2.512
C X D	78.561	8.	0.661
A X B X C	52.002	2.	0.437
A X B X D	102.546	4.	0.863
A X C X D	166.560	8.	1.401
B X C X D	124.050	8.	1.043
A X B X C X D	78.079	8.	0.657
ERROR	118.892	300.	

TABLE 17. MEANS - TOTAL-FREEZING

	A1 B1	A2 B1	A1 B2	A2 B2
D1 C1	635.2833	707.4333	473.7833	658.7833
C2	431.3167	923.7667	613.6000	703.4333
C3	462.2500	236.1500	660.6833	595.7500
D2 C1	503.8667	844.1833	441.0333	476.8667
C2	734.5333	547.0500	734.6500	398.6000
C3	513.9667	859.0667	191.2833	217.2000
D3 C1	858.8833	437.6167	901.3167	695.3000
C2	363.7000	392.1167	620.9833	478.1667
C3	381.9000	565.4667	715.8833	565.5333
D4 C1	747.5667	535.3000	383.6167	544.8500
C2	612.2833	717.3833	425.8333	647.0500
C3	666.5833	392.6167	544.8333	543.0500
D5 C1	464.9667	556.8000	208.3667	538.4667
C2	332.7333	469.3500	200.5167	698.5333
C3	511.5667	555.7667	410.5167	540.2167

TABLE 18. ANALYSIS OF VARIANCE - TOTAL-FREEZING

SOURCE	MS	DF	F
CONST (A)	166437.000	1.	1.012
MV-FRM (B)	129364.000	1.	0.786
INTEN (C)	169069.500	2.	1.028
FREQ (D)	208998.250	4.	1.270
A X B	6642.000	1.	0.040
A X C	60598.500	2.	0.368
A X D	253686.000	4.	1.542
B X C	81340.000	2.	0.494
B X D	449668.500	4.	2.733
C X D	171275.375	8.	1.041
A X B X C	69698.500	2.	0.424
A X B X D	216551.000	4.	1.316
A X C X D	258120.500	8.	1.569
B X C X D	133643.750	8.	0.812
A X B X C X D	66088.375	8.	0.402
ERROR	164536.691	300.	

TABLE 19. MEANS - MEAN MOVEMENT IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
D1 C1	560.7167	492.5667	726.2167	541.2167
C2	768.6833	276.2333	586.4000	496.5667
C3	737.7500	963.8500	535.3167	604.2500
D2 C1	696.1333	355.8167	758.9667	723.1333
C2	465.4667	652.9500	465.3500	801.4000
C3	686.0333	340.9333	1008.7167	982.8000
D3 C1	341.1167	762.3833	298.6833	504.7000
C2	836.3000	807.8833	579.0167	721.8333
C3	818.1000	634.5333	484.1167	634.4667
D4 C1	452.4333	664.7000	816.3833	655.1500
C2	587.7167	482.6167	774.1667	552.9500
C3	533.4167	807.3833	655.1667	656.9500
D5 C1	735.0333	643.2000	991.6333	661.5333
C2	867.2667	730.6500	999.4833	501.4667
C3	688.4333	644.2333	785.4833	659.7833

TABLE 20. ANALYSIS OF VARIANCE - MEAN MOVEMENT IN BLACK

SOURCE	MS	DF	F
CONST (A)	166500.000	1.	1.012
BV-FRR (B)	129424.000	1.	0.787
INTEN (C)	169099.000	2.	1.028
FREQ (D)	209015.500	4.	1.270
A X B	6584.000	1.	0.040
A X C	60565.000	2.	0.368
A X D	253669.500	4.	1.542
B X C	81313.000	2.	0.494
B X D	449652.000	4.	2.733
C X D	171267.750	8.	1.041
A X B X C	69725.000	2.	0.424
A X B X D	216566.500	4.	1.316
A X C X D	258128.000	8.	1.569
B X C X D	133650.750	8.	0.812
A X B X C X D	66081.250	8.	0.402
ERROR	164534.539	300.	

TABLE 21. MEANS - MEAN FREEZING IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
D1 C1	411.0833	227.5500	620.4333	504.7667
C2	709.5833	544.1500	596.7167	479.7000
C3	527.4833	448.8333	866.8833	659.4167
D2 C1	565.1667	328.1500	717.2167	475.5833
C2	901.9167	339.4167	828.6333	649.8667
C3	748.3000	593.7667	690.0667	614.9833
D3 C1	725.5333	327.5333	866.8667	566.6500
C2	747.9667	272.3500	530.7000	739.2333
C3	764.5833	620.0500	647.1500	702.5167
D4 C1	897.5833	318.8833	687.9000	445.8833
C2	723.5166	322.1000	564.0167	571.0333
C3	901.2500	759.2000	616.0667	587.2500
D5 C1	502.0000	586.8833	529.6667	606.7000
C2	633.6333	556.1667	710.2000	684.7833
C3	732.4833	410.6000	686.4000	732.5500

TABLE 22. ANALYSIS OF VARIANCE - MEAN FREEZING IN BLACK

SOURCE	MS	DF	F
CONST (A)	2478688.000	1.	42.298
BV-FRR (B)	411515.000	1.	7.022
INTEN (C)	429876.000	2.	7.336
FREQ (D)	71613.750	4.	1.222
A X B	730145.000	1.	12.460
A X C	92306.000	2.	1.575
A X D	123526.750	4.	2.108
B X C	52811.000	2.	0.901
B X D	124656.000	4.	2.127
C X D	74263.875	8.	1.267
A X B X C	104323.000	2.	1.780
A X B X D	78065.000	4.	1.332
A X C X D	97371.125	8.	1.662
B X C X D	110804.625	8.	1.891
A X B X C X D	54724.875	8.	0.934
ERROR	58601.086	300.	

TABLE 23. MEANS - MEAN MOVEMENT IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
D1 C1	8.8333	12.1667	2.6667	11.1667
C2	7.1667	7.5000	6.1667	8.5000
C3	4.1667	6.3333	2.6667	8.3333
D2 C1	5.3333	12.6667	2.5000	11.0000
C2	1.1667	10.3333	5.5000	6.3333
C3	3.8333	9.0000	4.3333	6.0000
D3 C1	4.6667	12.5000	1.6667	10.6667
C2	2.1667	17.0000	8.8333	3.0000
C3	1.6667	6.0000	7.8333	5.3333
D4 C1	2.3333	10.6667	4.5000	13.0000
C2	3.0000	11.5000	6.1667	7.0000
C3	1.8333	2.1667	4.8333	8.0000
D5 C1	7.8333	5.3333	6.5000	8.5000
C2	5.6667	10.3333	4.6667	5.3333
C3	4.8333	9.5000	4.6667	2.8333

TABLE 24. ANALYSIS OF VARIANCE - MEAN MOVEMENT IN WHITE

SOURCE	MS	DF	F
CONST (A)	1299.600	1.	35.388
BV-FRR (B)	28.900	1.	0.787
INTEN (C)	192.108	2.	5.231
FREQ (D)	13.094	4.	0.357
A X B	184.900	1.	5.035
A X C	104.425	2.	2.843
A X D	45.544	4.	1.240
B X C	28.308	2.	0.771
B X D	39.733	4.	1.082
C X D	12.469	8.	0.340
A X B X C	212.658	2.	5.791
A X B X D	77.956	4.	2.123
A X C X D	30.494	8.	0.830
B X C X D	37.017	8.	1.008
A X B X C X D	31.089	8.	0.847
ERROR	36.724	300.	

TABLE 25. MEANS - MEAN FREEZING IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
D1 C1	4.5000	12.6667	3.3333	11.5000
C2	7.6667	7.8333	8.5000	9.3333
C3	4.6667	7.1667	3.1667	9.0000
D2 C1	6.0000	12.8333	3.0000	11.0000
C2	1.8333	11.0000	6.1667	7.0000
C3	4.6667	9.3333	5.3333	6.8333
D3 C1	5.0000	13.0000	2.0000	11.1667
C2	2.8333	17.6667	9.3333	3.6667
C3	2.8333	6.6667	8.1667	5.6667
D4 C1	2.6667	11.3333	5.3333	11.5000
C2	3.6667	12.3333	8.6667	7.6667
C3	2.3333	3.1667	5.1667	8.5000
D5 C1	8.5000	5.6667	7.5000	9.3333
C2	6.5000	11.0000	5.5000	5.5000
C3	5.6667	9.8333	5.3333	3.6667

TABLE 26. ANALYSIS OF VARIANCE - MEAN FREEZING IN WHITE

SOURCE	MS	DF	F
CONST (A)	1254.400	1.	34.635
WV-FRM (B)	32.400	1.	0.895
INTEN (C)	175.086	2.	4.834
FREQ (D)	11.150	4.	0.308
A X B	179.211	1.	4.948
A X C	95.758	2.	2.644
A X D	48.983	4.	1.352
B X C	24.825	2.	0.685
B X D	37.039	4.	1.023
C X D	12.923	8.	0.357
A X B X C	206.286	2.	5.696
A X B X D	76.711	4.	2.118
A X C X D	31.227	8.	0.862
B X C X D	37.037	8.	1.023
A X B X C X D	30.380	8.	0.839
ERROR	36.218	300.	

TABLE 27. MEANS - TIME IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
D1 C1	18.3333	24.8333	6.0000	22.6667
C2	14.8333	15.3333	16.6667	17.8333
C3	8.8333	13.5000	5.8333	17.3333
D2 C1	11.3333	25.5000	5.5000	22.0000
C2	3.0000	21.3333	11.6667	13.3333
C3	8.5000	18.3333	9.6667	12.8333
D3 C1	9.6667	25.5000	3.6667	21.8333
C2	5.0000	34.6667	18.1667	6.6667
C3	4.5000	12.6667	16.0000	11.0000
D4 C1	5.0000	22.0000	9.8333	22.5000
C2	6.6667	23.8333	16.8333	14.6667
C3	4.1667	5.3333	10.0000	16.5000
D5 C1	16.3333	11.0000	14.0000	17.8333
C2	12.1667	21.3333	10.1667	10.8333
C3	10.5000	19.3333	10.0000	6.5000

TABLE 28. ANALYSIS OF VARIANCE - TIME IN BLACK

SOURCE	MS	DF	F
CONST (A)	5107.600	1.	35.072
WV-FRM (B)	122.500	1.	0.841
INTEN (C)	733.811	2.	5.039
FREQ (D)	48.333	4.	0.332
A X B	728.178	1.	5.000
A X C	400.133	2.	2.748
A X D	188.322	4.	1.293
B X C	106.033	2.	0.728
B X D	153.222	4.	1.052
C X D	50.502	8.	0.347
A X B X C	837.678	2.	5.752
A X B X D	309.122	4.	2.123
A X C X D	123.158	8.	0.846
B X C X D	147.620	8.	1.014
A X B X C X D	122.695	8.	0.842
ERROR	145.632	300.	

TABLE 29. MEANS - TIME IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
D1 C1	19.0833	29.1500	18.7500	16.4500
C2	5.1167	15.9167	14.1167	14.2000
C3	12.9167	8.1667	7.8833	11.5000
D2 C1	11.6833	20.2833	12.1500	14.9500
C2	6.7833	16.9000	10.8667	11.1000
C3	10.8167	16.1667	8.7667	10.0833
D3 C1	13.0833	14.9000	11.9500	14.6333
C2	17.2500	14.2833	21.5833	9.2833
C3	13.2000	15.1500	12.3833	10.1333
D4 C1	7.0500	22.2833	7.9833	14.6167
C2	13.3000	37.3667	13.9000	17.5000
C3	5.6333	8.2000	13.5667	12.5833
D5 C1	9.9333	12.7833	12.4500	10.3333
C2	9.2833	13.2667	6.7000	11.9333
C3	8.2000	16.9500	8.9667	11.1333

TABLE 30. ANALYSIS OF VARIANCE - TIME IN WHITE

SOURCE	MS	DF	F
CONST (A)	1057.900	1.	10.484
WV-FRM (B)	321.012	1.	3.181
INTEN (C)	458.572	2.	4.544
FREQ (D)	178.901	4.	1.773
A X B	739.803	1.	7.331
A X C	65.711	2.	0.651
A X D	255.651	4.	2.533
B X C	25.702	2.	0.255
B X D	4.314	4.	0.043
C X D	281.445	8.	2.789
A X B X C	93.788	2.	0.929
A X B X D	44.296	4.	0.439
A X C X D	116.262	8.	1.152
B X C X D	124.136	8.	1.230
A X B X C X D	67.458	8.	0.669
ERROR	100.909	300.	

TABLE 31. MEANS - CROSSES TO BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
D1 C1	26.0167	15.6667	25.7667	16.5167
C2	14.4000	22.0167	31.9333	32.8500
C3	52.7500	14.1000	63.3333	21.3000
D2 C1	14.5333	12.5000	53.4167	14.9333
C2	75.3167	12.2000	161.0000	18.3333
C3	140.1333	58.3167	20.9000	13.1333
D3 C1	224.1167	13.0833	61.6667	32.5833
C2	26.3167	11.7167	25.1500	30.8667
C3	65.8667	33.8833	26.8667	24.1500
D4 C1	39.3833	9.5000	28.9000	28.2167
C2	38.1167	32.2667	25.8833	52.3833
C3	25.7000	30.3833	15.6333	25.3667
D5 C1	11.1500	16.7667	12.6667	68.5333
C2	42.8000	12.1000	30.3667	54.2000
C3	28.9500	14.4167	72.5500	66.6000

TABLE 32. ANALYSIS OF VARIANCE - CROSSES TO BLACK

SOURCE	MS	DF	F
CONST (A)	50737.820	1.	5.959
BV-FRM (B)	1.141	1.	0.000
INTEN (C)	693.496	2.	0.081
FREC (D)	7239.342	4.	0.850
A x B	14819.281	1.	1.740
A x C	286.309	2.	0.034
A x D	13152.053	4.	1.545
B x C	6216.980	2.	0.730
B x D	7605.293	4.	0.893
C x D	9907.170	8.	1.164
A x B x C	2834.512	2.	0.333
A x B x D	6269.818	4.	0.736
A x C x D	10541.832	8.	1.238
B x C x D	8665.913	8.	1.018
A x B x C x D	5225.886	8.	0.614
ERROR	8514.680	300.	

TABLE 33. MEANS - CROSSES TO WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
D1 C1	15.4333	20.8667	15.2167	11.6000
C2	13.0167	9.1333	18.3667	17.1667
C3	18.2000	34.3833	12.6167	17.5833
D2 C1	16.3833	20.7500	13.8000	16.4833
C2	10.1000	17.8333	13.0833	11.0667
C3	10.5167	13.2667	16.0500	15.8500
D3 C1	5.7500	32.0167	4.1500	16.2667
C2	5.4333	16.6833	14.3833	16.5833
C3	11.6667	14.3667	13.8000	15.0167
D4 C1	5.3000	17.8167	15.7000	20.6833
C2	12.5167	29.2333	15.2667	15.5833
C3	5.3667	21.5333	15.8667	15.3167
D5 C1	18.0333	15.6667	21.9667	16.9167
C2	17.4000	13.7833	16.5167	14.0167
C3	14.1667	17.9167	14.4333	17.5333

TABLE 34. ANALYSIS OF VARIANCE - CROSSES TO WHITE

SOURCE	MS	DF	F
CONST (A)	1309.219	1.	9.455
BV-FRM (B)	88.017	1.	0.636
INTEN (C)	64.427	2.	0.465
FREQ (D)	108.947	4.	0.787
A x B	786.972	1.	5.683
A x C	54.378	2.	0.393
A x D	260.371	4.	1.880
B x C	29.396	2.	0.212
B x D	77.945	4.	0.563
C x D	100.906	8.	0.729
A x B x C	0.580	2.	0.004
A x B x D	97.597	4.	0.705
A x C x D	188.647	8.	1.362
B x C x D	298.213	8.	2.154
A x B x C x D	34.715	8.	0.251
ERROR	138.470	300.	

TABLE 35. MEANS - TOTAL CROSSES

	A1 B1	A2 B1	A1 B2	A2 B2
D1 C1	15.8833	10.3167	20.7167	13.5333
C2	31.9667	4.6833	18.9000	13.1667
C3	14.5833	33.3500	21.8167	45.7333
D2 C1	14.5167	11.0333	33.6833	14.7167
C2	36.4833	13.8333	16.2000	18.9333
C3	40.2500	13.0167	20.0167	53.1333
D3 C1	11.7000	13.0833	5.8333	17.2833
C2	25.1000	13.7167	14.2500	19.8333
C3	15.9167	25.8333	15.3500	33.8000
D4 C1	25.2833	14.3167	22.9167	9.1500
C2	12.0667	13.3833	15.3833	21.2333
C3	15.1167	32.5667	15.2333	18.1000
D5 C1	15.6667	12.6500	29.4833	22.8667
C2	18.7667	25.1333	35.0500	13.4333
C3	15.0333	13.7167	15.9667	22.0833

TABLE 36. ANALYSIS OF VARIANCE - TOTAL CROSSES

SOURCE	MS	DF	F
CONST (A)	245.197	1.	0.385
BV-FRM (B)	686.305	1.	1.077
INTEN (C)	2283.501	2.	3.583
FREQ (D)	447.052	4.	0.701
A x B	808.043	1.	1.268
A x C	2026.227	2.	3.179
A x D	393.678	4.	0.618
B x C	236.680	2.	0.371
B x D	203.563	4.	0.319
C x D	450.869	8.	0.707
A x B x C	493.341	2.	0.774
A x B x D	642.949	4.	1.009
A x C x D	366.808	8.	0.575
B x C x D	345.178	8.	0.542
A x B x C x D	543.924	8.	0.853
ERROR	637.396	300.	

TABLE 37. MEANS - PERCENTAGE-FREEZING IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
D1 C1	36.0500	17.4833	44.0333	36.1833
C2	32.9000	45.8167	51.4333	49.0167
C3	39.4167	22.0000	55.0833	33.8667
D2 C1	40.8000	33.9333	31.7833	25.4667
C2	66.2833	22.6000	64.7667	33.2667
C3	43.1000	47.8000	29.5167	26.6500
D3 C1	64.0833	24.5167	62.4167	54.4167
C2	35.4167	16.0833	30.4500	57.4833
C3	46.9333	36.7167	47.0000	47.3667
D4 C1	55.8667	13.1833	50.9333	36.4833
C2	42.7000	27.3333	37.7000	47.7500
C3	52.9333	35.6333	35.5833	35.4000
D5 C1	34.1833	39.1000	17.3000	56.8667
C2	40.5500	26.3500	31.3167	54.1667
C3	41.1667	25.1500	37.4333	39.6000

TABLE 38. ANALYSIS OF VARIANCE - PERCENTAGE-FREEZING IN BLACK

SOURCE	MS	DF	F
CONST (A)	6526.133	1.	7.133
MV-FRN (B)	1707.602	1.	1.866
INTEN (C)	299.230	2.	0.327
FREQ (D)	338.906	4.	0.370
A X B	7284.891	1.	7.962
A X C	79.492	2.	0.087
A X D	913.887	4.	0.999
B X C	556.090	2.	0.608
B X D	1327.162	4.	1.451
C X D	950.740	8.	1.039
A X B X C	711.355	2.	0.777
A X B X D	1312.811	4.	1.435
A X C X D	1914.859	8.	2.093
B X C X D	262.256	8.	0.287
A X B X C X D	210.238	8.	0.230
ERROR	914.965	300.	

TABLE 39. MEANS - PERCENTAGE-FREEZING IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
D1 C1	26.9667	14.2000	45.1333	27.1000
C2	54.9833	8.4167	35.6000	29.1167
C3	31.0833	35.3000	40.1333	41.6167
D2 C1	31.7833	13.6000	47.9000	33.4167
C2	40.0167	26.6000	34.0000	42.7000
C3	49.8667	23.6500	55.9500	53.1667
D3 C1	28.9167	24.6333	21.1333	31.2000
C2	52.9500	24.4833	28.3833	41.9833
C3	60.3833	28.0833	33.9000	33.0167
D4 C1	50.1333	24.0667	44.3667	16.9500
C2	33.0833	24.8000	45.0000	31.2667
C3	40.4000	49.0667	37.1333	38.6000
D5 C1	34.4667	37.9667	44.6167	38.0833
C2	47.2333	44.0500	55.4333	26.3000
C3	37.3833	25.0500	37.4667	32.7167

TABLE 40. ANALYSIS OF VARIANCE - PERCENTAGE-FREEZING IN WHITE

SOURCE	MS	DF	F
CONST (A)	9266.453	1.	14.289
MV-FRN (B)	991.855	1.	1.529
INTEN (C)	1641.311	2.	2.531
FREQ (D)	440.296	4.	0.679
A X B	1611.578	1.	2.485
A X C	343.947	2.	0.530
A X D	94.226	4.	0.145
B X C	211.967	2.	0.327
B X D	988.768	4.	1.525
C X D	541.708	8.	0.835
A X B X C	410.609	2.	0.633
A X B X D	1119.177	4.	1.726
A X C X D	930.347	8.	1.435
B X C X D	322.246	8.	0.497
A X B X C X D	370.907	8.	0.572
ERROR	648.488	300.	

APPENDIX H

Summaries of the means and of the analyses of variance of retention test one measures (collapsed over frequency).

Parameter identification key:

Constancy

A1 - Constant current
A2 - Constant voltage

Waveform

B1 - Sine wave
B2 - Square wave

Intensity

C1 - 5 db
C2 - 10 db
C3 - 15 db

TABLE 1. MEANS - MOVEMENT IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
C1	270.7300	426.5433	190.0933	287.4733
C2	157.1567	403.2100	215.3233	237.1233
C3	169.8867	256.0233	183.2667	213.0433

TABLE 2. ANALYSIS OF VARIANCE - MOVEMENT IN BLACK

SOURCE	MS	DF	F
CONST (A)	1002282.750	1.	25.203
BV-FRM (B)	311614.250	1.	7.836
INTER (C)	234265.625	2.	5.891
A X B	294524.500	1.	7.406
A X C	50900.875	2.	1.280
B X C	68953.250	2.	1.734
A X B X C	72923.250	2.	1.834
ERROR	39768.258	348.	

TABLE 3. MEANS - FREEZING IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
C1	372.1833	195.6533	291.5500	295.3400
C2	337.7566	206.7167	299.7533	348.0333
C3	337.5667	265.7900	321.5733	279.3067

TABLE 4. ANALYSIS OF VARIANCE - FREEZING IN BLACK

SOURCE	MS	DF	F
CONST (A)	340595.500	1.	3.208
BV-FRM (B)	35746.000	1.	0.337
INTER (C)	4994.500	2.	0.047
A X B	378516.500	1.	3.565
A X C	15521.375	2.	0.146
B X C	23541.250	2.	0.222
A X B X C	56270.375	2.	0.530
ERROR	106176.360	348.	

TABLE 5. MEANS - MOVEMENT IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
C1	308.1900	432.0933	325.4500	297.6100
C2	295.5200	369.5400	334.0233	337.4533
C3	295.4533	377.4800	315.4200	277.0133

TABLE 6. ANALYSIS OF VARIANCE - MOVEMENT IN WHITE

SOURCE	MS	DF	F
CONST (A)	359077.500	1.	6.764
BV-FRM (B)	11963.000	1.	0.225
INTER (C)	39616.250	2.	0.746
A X B	114090.000	1.	2.149
A X C	23519.250	2.	0.443
B X C	296.000	2.	0.006
A X B X C	1760.000	2.	0.033
ERROR	53083.021	348.	

TABLE 7. MEANS - FREEZING IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
C1	248.8900	161.9200	342.8800	224.5367
C2	405.5666	200.1200	346.2600	276.8400
C3	397.2533	300.7000	375.9400	380.0366

TABLE 8. ANALYSIS OF VARIANCE - FREEZING IN WHITE

SOURCE	MS	DF	F
CONST (A)	581589.000	1.	11.254
BV-FRM (B)	204674.000	1.	2.347
INTER (C)	346726.500	2.	3.975
A X B	57223.500	1.	0.656
A X C	71766.750	2.	0.823
B X C	73316.500	2.	0.841
A X B X C	100691.000	2.	1.154
ERROR	87219.343	348.	

TABLE 9. MEANS - NO. MOVEMENTS IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
C1	20.1667	22.2667	17.2667	20.7667
C2	13.4333	22.7667	15.6667	17.8000
C3	14.1333	16.6333	14.2333	15.1333

TABLE 10. ANALYSIS OF VARIANCE - NO. MOVEMENTS IN BLACK

SOURCE	MS	DF	F
CONST (A)	1621.378	1.	12.602
BV-FRP (B)	457.678	1.	3.559
INTER (C)	449.544	2.	3.494
A x B	14.399	1.	0.112
A x C	147.078	2.	1.143
B x C	137.778	2.	1.071
A x B x C	350.400	2.	2.723
ERROR	128.663	348.	

TABLE 11. MEANS - NO. FREEZING IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
C1	13.5667	11.7333	7.8000	9.4667
C2	8.7667	10.5333	7.7667	10.5333
C3	9.9667	9.1333	8.5000	9.1667

TABLE 12. ANALYSIS OF VARIANCE - NO. FREEZING IN BLACK

SOURCE	MS	DF	F
CONST (A)	32.400	1.	0.339
BV-FRP (B)	306.178	1.	3.208
INTER (C)	90.103	2.	0.944
A x B	72.900	1.	0.764
A x C	80.275	2.	0.841
B x C	112.469	2.	1.178
A x B x C	17.775	2.	0.186
ERROR	95.442	348.	

TABLE 13. MEANS - NO. MOVEMENTS IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
C1	19.1000	21.5333	18.9333	23.7667
C2	20.8667	23.3333	21.7667	20.1000
C3	20.3667	19.2000	20.3000	20.5333

TABLE 14. ANALYSIS OF VARIANCE - NO. MOVEMENTS IN WHITE

SOURCE	MS	DF	F
CONST (A)	124.844	1.	0.791
BV-FRP (B)	2.178	1.	0.014
INTER (C)	60.211	2.	0.382
A x B	0.400	1.	0.003
A x C	137.645	2.	0.872
B x C	40.145	2.	0.256
A x B x C	91.633	2.	0.581
ERROR	157.805	348.	

TABLE 15. MEANS - NO. FREEZING IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
C1	12.9000	11.1333	15.0333	12.8667
C2	18.6333	11.4667	14.2667	13.6667
C3	18.7000	12.2333	14.9667	14.1000

TABLE 16. ANALYSIS OF VARIANCE - NO. FREEZING IN WHITE

SOURCE	MS	DF	F
CONST (A)	565.003	1.	4.720
BV-FRM (B)	36.735	1.	0.307
INTER (C)	71.853	2.	0.600
A x B	150.803	1.	1.260
A x C	6.886	2.	0.058
B x C	37.870	2.	0.316
A x B x C	52.002	2.	0.434
ERROR	119.715	348.	

- TABLE 17. MEANS - TOTAL-FREEZING

	A1 B1	A2 B1	A1 B2	A2 B2
C1	642.9133	416.2666	481.6233	582.8533
C2	494.9133	609.9333	515.1166	585.1566
C3	507.2533	521.8133	504.6400	442.3500

TABLE 18. ANALYSIS OF VARIANCE - TOTAL-FREEZING

SOURCE	MS	DF	F
CONST (A)	166442.000	1.	0.983
BV-FRM (B)	129369.000	1.	0.764
INTEN (C)	169068.500	2.	0.999
A X B	6628.000	1.	0.039
A X C	60592.500	2.	0.358
B X C	81335.000	2.	0.480
A X B X C	69707.000	2.	0.412
ERROR	169280.625	348.	

TABLE 19. MEANS - MEAN MOVEMENT IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
C1	557.0866	583.7333	718.3766	617.1466
C2	705.0866	590.0666	680.8833	614.8433
C3	692.7466	678.1866	695.3599	707.6499

TABLE 20. ANALYSIS OF VARIANCE - MEAN MOVEMENT IN BLACK

SOURCE	MS	DF	F
CONST (A)	166502.000	1.	0.984
BV-FRM (B)	129430.000	1.	0.765
INTEN (C)	169098.000	2.	0.999
A X B	6568.000	1.	0.039
A X C	60566.000	2.	0.358
B X C	81306.000	2.	0.480
A X B X C	69735.000	2.	0.412
ERROR	169280.482	348.	

TABLE 21. MEANS - MEAN FREEZING IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
C1	621.0733	357.8000	684.4166	519.5166
C2	743.3233	406.8366	646.0533	624.9233
C3	734.8199	566.4900	701.3133	659.3433

TABLE 22. ANALYSIS OF VARIANCE - MEAN FREEZING IN BLACK

SOURCE	MS	DF	F
CONST (A)	2478452.000	1.	39.443
BV-FRM (B)	411519.000	1.	6.548
INTEN (C)	425875.000	2.	6.841
A X B	730129.000	1.	11.618
A X C	92300.000	2.	1.469
B X C	52806.500	2.	0.840
A X B X C	104331.500	2.	1.660
ERROR	62842.247	348.	

TABLE 23. MEANS - MEAN MOVEMENT IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
C1	5.8000	10.6667	3.5667	10.4667
C2	3.8333	11.3333	7.0667	6.0333
C3	3.2667	6.6000	4.6667	6.8000

TABLE 24. ANALYSIS OF VARIANCE - MEAN MOVEMENT IN WHITE

SOURCE	MS	DF	F
CONST (A)	1299.600	1.	35.862
BV-FRM (B)	28.900	1.	0.797
INTEN (C)	192.108	2.	5.301
A X B	184.900	1.	5.102
A X C	104.425	2.	2.882
B X C	28.308	2.	0.781
A X B X C	212.658	2.	5.868
ERROR	36.239	348.	

TABLE 25. MEANS - MEAN FREEZING IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
C1	6.3333	11.1000	4.2333	10.9000
C2	4.5000	11.9667	7.6333	6.6333
C3	4.0333	7.2333	5.4333	6.7333

TABLE 26. ANALYSIS OF VARIANCE - MEAN FREEZING IN WHITE

SOURCE	MS	DF	F
CONST (A)	1254.400	1.	35.053
BV-FRM (B)	32.400	1.	0.905
INTEN (C)	175.086	2.	4.893
A X B	179.211	1.	5.008
A X C	95.758	2.	2.676
B X C	24.825	2.	0.694
A X B X C	206.286	2.	5.764
ERROR	35.786	348.	

TABLE 27. MEANS - TIME IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
C1	12.1333	21.7667	7.8000	21.3667
C2	8.3333	23.3000	14.7000	12.4667
C3	7.3000	13.8333	10.3000	12.8333

TABLE 28. ANALYSIS OF VARIANCE - TIME IN BLACK

SOURCE	MS	DF	F
CONST (A)	5107.600	1.	35.522
BV-FRM (B)	122.500	1.	0.852
INTEN (C)	733.811	2.	5.104
A X B	728.178	1.	5.064
A X C	400.133	2.	2.783
B X C	106.033	2.	0.737
A X B X C	837.678	2.	5.826
ERROR	143.786	348.	

TABLE 29. MEANS - TIME IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
C1	12.1667	19.8800	12.6567	14.1967
C2	11.1467	15.5467	13.4333	12.8033
C3	10.1533	12.9267	10.3133	11.0867

TABLE 30. ANALYSIS OF VARIANCE - TIME IN WHITE

SOURCE	MS	DF	F
CONST (A)	1057.905	1.	9.972
BV-FRP (B)	321.014	1.	3.026
INTEN (C)	458.571	2.	4.322
A X B	739.795	1.	6.973
A X C	65.707	2.	0.619
B X C	25.699	2.	0.242
A X B X C	93.793	2.	0.884
ERROR	106.091	348.	

TABLE 31. MEANS - CROSSES TO BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
C1	63.8400	13.5033	36.4833	32.2367
C2	43.3900	18.0600	55.6667	37.7267
C3	64.2800	30.2200	40.6567	30.1100

TABLE 32. ANALYSIS OF VARIANCE - CROSSES TO BLACK

SOURCE	MS	DF	F
CONST (A)	50737.875	1.	5.953
BV-FRM (B)	1.180	1.	0.000
INTEN (C)	693.508	2.	0.081
A X B	14819.180	1.	1.739
A X C	286.262	2.	0.034
B X C	6216.941	2.	0.729
A X B X C	2834.570	2.	0.333
ERROR	8523.553	348.	

TABLE 33. MEANS - CROSSES TO WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
C1	13.7800	21.4233	14.9667	16.3900
C2	12.5733	17.7333	15.5233	14.8833
C3	12.7833	20.2933	14.5533	16.3400

TABLE 34. ANALYSIS OF VARIANCE - CROSSES TO WHITE

SOURCE	MS	DF	F
CONST (A)	1309.226	1.	9.355
BV-FRM (B)	88.020	1.	0.629
INTEN (C)	64.426	2.	0.460
A X B	786.957	1.	5.623
A X C	54.373	2.	0.389
B X C	29.393	2.	0.210
A X B X C	0.588	2.	0.004
ERROR	139.944	348.	

TABLE 35. MEANS - TOTAL CROSSES

	A1 B1	A2 B1	A1 B2	A2 B2
C1	16.6100	12.2800	22.5267	15.5100
C2	24.8767	14.1500	20.7567	17.3200
C3	22.5800	23.6967	20.0767	34.5700

TABLE 36. ANALYSIS OF VARIANCE - TOTAL CROSSES

SOURCE	MS	DF	F
CONST (A)	245.201	1.	0.403
BV-FRM (B)	686.313	1.	1.129
INTEN (C)	2283.502	2.	3.755
A X B	808.027	1.	1.329
A X C	2026.220	2.	3.332
B X C	236.671	2.	0.389
A X B X C	493.352	2.	0.811
ERROR	608.110	348.	

TABLE 37. MEANS - PERCENTAGE-FREEZING IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
C1	46.9567	25.6433	41.2533	41.8833
C2	47.5700	27.6367	43.1333	48.3367
C3	44.7100	33.4600	40.9233	36.5767

TABLE 38. ANALYSIS OF VARIANCE - PERCENTAGE FREEZING IN BLACK

SOURCE	MS	DF	F
CONST (A)	6526.172	1.	7.170
BV-FRM (B)	1707.641	1.	1.876
INTEN (C)	299.238	2.	0.329
A X B	7284.797	1.	8.003
A X C	79.453	2.	0.087
B X C	556.047	2.	0.611
A X B X C	711.422	2.	0.782
ERROR	910.245	348.	

TABLE 39. MEANS - PERCENTAGE-FREEZING IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
C1	34.4533	22.8933	40.6700	29.3500
C2	45.6533	25.4700	35.6833	34.2733
C3	43.8233	32.2300	40.8367	39.8233

TABLE 40. ANALYSIS OF VARIANCE - PERCENTAGE-FREEZING IN WHITE

SOURCE	MS	DF	F
CONST (A)	9266.461	1.	14.497
BV-FRM (B)	991.887	1.	1.552
INTEN (C)	1641.311	2.	2.568
A X B	1611.539	1.	2.521
A X C	343.939	2.	0.538
B X C	211.945	2.	0.332
A X B X C	410.633	2.	0.642
ERROR	639.191	348.	

APPENDIX I

Summaries of the means and of the analyses of variance of retention test two measures:

Parameter identification key:

Constancy

A1 - Constant current
A2 - Constant voltage

Waveform

B1 - Sine wave
B2 - square wave

Intensity

C1 - 5 db
C2 - 10 db
C3 - 15 db

Frequency

D1 - 60 Hz
D2 - 120 Hz
D3 - 240 Hz
D4 - 480 Hz
D5 - 960 Hz

TABLE 1. MEANS - MOVEMENT IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
D1 C1	425.4833	401.8333	265.1500	359.9500
C2	220.2333	232.9333	275.1667	326.4000
C3	276.9500	296.9167	265.2000	462.8667
D2 C1	272.8333	506.3833	186.3667	327.4667
C2	195.8333	387.5667	118.4833	348.0167
C3	194.0500	383.4000	115.8333	286.5167
D3 C1	224.3500	379.2667	155.0167	413.6000
C2	85.7667	313.0167	383.1333	109.9333
C3	196.7167	240.6333	352.0000	338.6500
D4 C1	79.3333	431.3667	158.3333	418.9500
C2	211.3167	314.0167	376.5333	286.3500
C3	331.2833	229.6667	262.3333	357.9833
D5 C1	418.0167	336.8667	175.2167	352.4500
C2	337.8833	230.1167	192.9333	302.7000
C3	214.5833	334.0000	235.2667	319.1000

TABLE 2. ANALYSIS OF VARIANCE - MOVEMENT IN BLACK

SOURCE	MS	DF	F
CONST (A)	782255.250	1.	17.345
NV-FRM (B)	2263.750	1.	0.050
INTEN (C)	82883.500	2.	1.838
FREQ (D)	27105.250	4.	0.601
A X B	1764.250	1.	0.039
A X C	96264.000	2.	2.134
A X D	62346.875	4.	1.382
B X C	82287.875	2.	1.825
B X D	71055.750	4.	1.576
C X D	19343.188	8.	0.429
A X B X C	45385.250	2.	1.006
A X B X D	63786.438	4.	1.414
A X C X D	51629.969	8.	1.145
B X C X D	10687.781	8.	0.237
A X B X C X D	53372.031	8.	1.183
ERROR	45099.565	300.	

TABLE 3. MEANS - FREEZING IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
D1 C1	121.2167	203.8000	475.6833	98.1333
C2	107.8333	286.3167	424.7333	127.4167
C3	130.4833	235.2833	357.6333	259.9667
D2 C1	253.1000	344.4500	266.6500	87.1667
C2	464.5667	166.6667	245.2833	172.5000
C3	95.3833	422.6667	65.6667	126.9000
D3 C1	345.8000	159.4500	385.0500	235.5333
C2	157.6000	172.2000	246.2167	215.4333
C3	85.7500	363.2500	165.7667	330.4333
D4 C1	119.6833	267.3667	77.2833	257.4333
C2	121.3500	223.2833	181.7167	154.6333
C3	558.5333	318.8000	122.6333	105.6500
D5 C1	201.0333	197.7333	47.0000	213.8833
C2	298.0500	278.6833	285.8500	100.3000
C3	146.3833	342.0333	272.8333	414.8667

TABLE 4. ANALYSIS OF VARIANCE - FREEZING IN BLACK

SOURCE	MS	DF	F
CONST (A)	89.250	1.	0.001
NV-FRM (B)	42780.500	1.	0.559
INTEN (C)	31478.125	2.	0.411
FREQ (D)	12229.875	4.	0.160
A X B	227859.000	1.	2.976
A X C	190296.875	2.	2.486
A X D	38844.375	4.	0.507
B X C	10856.500	2.	0.142
B X D	199992.563	4.	2.612
C X D	58891.438	8.	0.769
A X B X C	890.125	2.	0.012
A X B X D	133771.125	4.	1.747
A X C X D	133305.094	8.	1.741
B X C X D	65062.750	8.	0.850
A X B X C X D	62234.281	8.	0.813
ERROR	76557.323	300.	

TABLE 5. MEANS - MOVEMENT IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
D1 C1	411.2167	427.7833	210.9667	451.3667
C2	470.7333	399.2667	364.3667	506.8167
C3	331.3833	498.6167	280.9167	320.1333
D2 C1	460.9667	219.4167	433.2833	616.4333
C2	256.6000	418.3500	314.1667	452.2500
C3	242.3333	284.6167	576.7000	388.0333
D3 C1	394.4667	421.7833	291.6000	414.1833
C2	448.6500	522.8833	321.9833	451.9667
C3	408.2833	363.1000	468.7667	210.9833
D4 C1	408.8167	358.5667	576.6333	411.8333
C2	498.6833	407.8333	387.1333	422.3500
C3	245.9167	373.1000	487.0167	366.7333
D5 C1	463.8000	406.9667	426.2000	503.9833
C2	254.9167	363.5167	489.7000	478.7500
C3	319.1333	331.4500	364.3500	293.2833

TABLE 6. ANALYSIS OF VARIANCE - MOVEMENT IN WHITE

SOURCE	MS	DF	F
CONST (A)	22789.000	1.	0.405
NV-FRM (B)	75710.500	1.	1.346
INTEN (C)	124995.750	2.	2.222
FREQ (D)	6840.125	4.	0.122
A X B	1237.000	1.	0.022
A X C	62326.000	2.	1.108
A X D	40602.750	4.	0.722
B X C	4497.500	2.	0.080
B X D	160191.375	4.	2.848
C X D	28135.063	8.	0.500
A X B X C	218622.000	2.	3.887
A X B X D	23314.625	4.	0.415
A X C X D	45120.063	8.	0.802
B X C X D	44162.438	8.	0.785
A X B X C X D	33567.313	8.	0.597
ERROR	56243.900	300.	

TABLE 7. MEANS - FREEZING IN WHITE

		A1 B1	A2 B1	A1 B2	A2 B2
D1	C1	242.0833	166.7833	244.2000	290.5500
	C2	406.2000	281.4833	131.7333	239.3667
	C3	461.1833	169.1833	252.2500	157.0333
D2	C1	213.1000	129.7500	313.7000	168.9333
	C2	283.0000	227.4167	522.0667	227.2333
	C3	525.2000	109.1167	433.8000	398.5500
D3	C1	235.3833	239.5000	364.3333	136.6833
	C2	467.9833	191.9000	248.6667	422.6667
	C3	509.2500	233.0167	213.4667	319.9333
D4	C1	592.1667	142.7000	387.7500	111.7833
	C2	368.6500	254.8667	254.6167	336.6667
	C3	63.8667	278.4333	328.0167	369.8333
D5	C1	117.1500	258.4333	547.5833	129.6833
	C2	311.1500	327.6833	227.5167	318.7500
	C3	519.9000	152.5167	323.5500	172.7500

TABLE 8. ANALYSIS OF VARIANCE - FREEZING IN WHITE

SOURCE	MS	DF	F
CONST (A)	965085.000	1.	15.293
NV-FRM (B)	593.000	1.	0.009
INTEN (C)	101630.750	2.	1.610
FREQ (D)	24035.188	4.	0.381
A X B	125504.000	1.	1.989
A X C	97480.125	2.	1.545
A X D	29150.438	4.	0.462
B X C	25708.750	2.	0.407
B X D	67257.125	4.	1.066
C X D	36821.156	8.	0.583
A X B X C	199609.500	2.	3.163
A X B X D	69171.063	4.	1.096
A X C X D	127010.125	8.	2.013
B X C X D	82531.188	8.	1.308
A X B X C X D	118095.906	8.	1.871
ERROR	63106.238	300.	

TABLE 9. MEANS - NO. MOVEMENTS IN BLACK

		A1 B1	A2 B1	A1 B2	A2 B2
D1	C1	18.3333	25.3333	16.1667	17.3333
	C2	13.6667	18.3333	23.8333	22.6667
	C3	14.6667	18.6667	20.1667	29.6667
D2	C1	15.8333	30.0000	11.8333	20.5000
	C2	11.1667	27.0000	15.3333	23.6667
	C3	8.8333	34.5000	9.8333	18.8333
D3	C1	21.3333	26.8333	14.3333	23.8333
	C2	7.6667	24.1667	22.3333	8.3333
	C3	11.8333	21.1667	23.1667	21.0000
D4	C1	7.5000	29.3333	13.0000	27.8333
	C2	17.0000	24.1667	22.5000	18.3333
	C3	26.6667	16.1667	5.8333	14.5000
D5	C1	24.1667	22.6667	11.0000	23.5000
	C2	20.8333	19.3333	15.3333	15.0000
	C3	13.5000	22.8333	17.5000	20.6667

TABLE 10. ANALYSIS OF VARIANCE - NO. MOVEMENTS IN BLACK

SOURCE	MS	DF	F
CONST (A)	3204.100	1.	24.602
NV-FRM (B)	246.678	1.	1.894
INTEN (C)	113.264	2.	0.870
FREQ (D)	18.215	4.	0.140
A X B	360.000	1.	2.764
A X C	238.033	2.	1.828
A X D	287.565	4.	2.208
B X C	229.478	2.	1.762
B X D	195.240	4.	1.499
C X D	80.453	8.	0.618
A X B X C	282.634	2.	2.170
A X B X D	191.396	4.	1.470
A X C X D	195.394	8.	1.500
B X C X D	177.145	8.	1.360
A X B X C X D	209.009	8.	1.605
ERROR	130.237	300.	

TABLE 11. MEANS - NO. FREEZING IN BLACK

		A1 B1	A2 B1	A1 B2	A2 B2
D1	C1	10.3333	15.5000	11.3333	8.0000
	C2	8.6667	10.8333	16.1667	10.8333
	C3	8.6667	10.5000	13.5000	12.3333
D2	C1	11.8333	21.5000	7.3333	6.0000
	C2	8.8333	13.1667	10.5000	12.8333
	C3	4.5000	25.3333	5.0000	10.0000
D3	C1	11.1667	12.5000	11.1667	9.6667
	C2	3.8333	9.3333	14.5000	3.8333
	C3	6.3333	8.8333	11.1667	16.1667
D4	C1	5.8333	16.5000	4.0000	17.1667
	C2	7.0000	14.0000	13.6667	11.0000
	C3	21.6667	9.0000	5.6667	9.3333
D5	C1	15.1667	13.5000	3.3333	9.5000
	C2	16.0000	11.6667	9.0000	6.6667
	C3	7.3333	16.5000	12.6667	13.8333

TABLE 12. ANALYSIS OF VARIANCE - NO. FREEZING IN BLACK

SOURCE	MS	DF	F
CONST (A)	485.344	1.	3.991
NV-FRM (B)	246.678	1.	2.028
INTEN (C)	19.300	2.	0.159
FREQ (D)	30.581	4.	0.251
A X B	284.444	1.	2.339
A X C	167.411	2.	1.376
A X D	141.983	4.	1.167
B X C	215.644	2.	1.773
B X D	213.081	4.	1.752
C X D	22.876	8.	0.188
A X B X C	55.645	2.	0.458
A X B X D	122.889	4.	1.010
A X C X D	148.487	8.	1.221
B X C X D	110.506	8.	0.909
A X B X C X D	129.964	8.	1.069
ERROR	121.621	300.	

TABLE 13. MEANS - NO. MOVEMENTS IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
B1 C1	24.3333	23.0000	13.5000	25.3333
C2	29.8333	25.8333	15.6667	30.1667
C3	27.0000	24.6667	21.3333	28.6667
B2 C1	25.3333	16.8333	22.6667	29.1667
C2	2C.0000	26.5C00	21.8333	28.0000
C3	24.1667	16.8333	3C.8333	28.6667
B3 C1	25.8333	32.5CCC	22.0000	24.5000
C2	30.1667	30.00C0	24.5000	33.0000
C3	28.6667	28.1667	28.3333	18.5000
B4 C1	2C.5000	24.3333	31.8333	21.5000
C2	37.0000	26.5C00	23.8333	26.1667
C3	11.1667	22.3333	25.0000	28.5000
B5 C1	21.0000	26.6667	25.6667	24.5000
C2	22.8333	26.1667	22.1667	28.3333
C3	26.0000	21.6667	17.1667	19.3333

TABLE 14. ANALYSIS OF VARIANCE - NO. MOVEMENTS IN WHITE

SOURCE	MS	DF	F
CONST (A)	116.736	1.	0.561
NV-FRN (B)	4.668	1.	0.022
INTEN (C)	246.225	2.	1.182
FREQ (D)	128.760	4.	0.618
A x B	143.137	1.	0.687
A x C	92.770	2.	0.445
A x D	47.576	4.	0.228
B x C	102.704	2.	0.493
B x C	276.274	4.	1.327
C x D	88.520	8.	0.425
A x B x C	150.936	2.	0.725
A x B x C	211.935	4.	1.018
A x C x D	127.870	8.	0.614
B x C x D	173.609	8.	0.834
A x B x C x D	134.204	8.	0.644
ERROR	208.257	300.	

TABLE 15. MEANS - NO. FREEZING IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
B1 C1	17.GC00	13.8333	8.8333	16.3333
C2	25.50C0	19.1667	12.1667	18.5000
C3	15.5000	16.8333	15.1667	11.6667
B2 C1	17.6667	9.0000	18.50CC	15.1667
C2	18.0000	12.6667	17.6667	17.5000
C3	2C.1667	8.0000	26.3333	20.3333
B3 C1	16.1667	18.6667	15.3333	10.6667
C2	26.6667	15.6667	17.3333	28.8333
C3	23.6667	16.6667	17.3333	14.3333
B4 C1	15.5000	12.1667	23.3333	11.3333
C2	27.3333	16.5000	15.50CC	19.1667
C3	6.8333	15.50CG	25.3333	23.8333
B5 C1	1C.5000	18.0000	22.3333	11.0000
C2	18.50C0	19.0CCC	16.500C	2C.5000
C3	20.1667	15.8333	12.6667	12.8333

TABLE 16. ANALYSIS OF VARIANCE - NO. FREEZING IN WHITE

SOURCE	MS	DF	F
CONST (A)	577.600	1.	3.419
NV-FRN (B)	3.211	1.	0.019
INTEN (C)	404.233	2.	2.393
FREG (D)	87.438	4.	0.518
A x B	187.778	1.	1.112
A x C	72.634	2.	0.430
A x C	93.968	4.	0.556
B x C	78.145	2.	0.463
B x C	287.857	4.	1.704
C x C	44.671	8.	0.264
A x B x C	470.811	2.	2.787
A x B x D	95.132	4.	0.563
A x C x D	92.939	8.	0.550
B x C x D	171.749	8.	1.017
A x B x C x D	137.061	8.	0.811
ERROR	168.921	300.	

TABLE 17. MEANS - TOTAL-FREEZING

	A1 B1	A2 B1	A1 B2	A2 B2
B1 C1	546.7C0C	605.4333	744.8333	458.0833
C2	323.0667	919.25CC	7C3.9000	493.8167
C3	407.4333	532.2000	666.8333	722.8333
B2 C1	525.9333	850.8333	453.0167	414.6333
C2	66C.4000	554.2333	363.7667	520.5167
C3	291.4333	806.2667	185.500C	413.4167
B3 C1	57C.1500	538.7167	544.0667	649.1333
C2	283.3667	485.2167	625.3500	325.3667
C3	282.4667	603.8833	517.7667	669.0833
B4 C1	199.0167	698.7333	235.6167	676.3833
C2	332.6667	537.3000	558.2500	440.9833
C3	890.2167	548.4667	384.9667	463.6333
B5 C1	619.0500	934.6000	228.2167	566.3333
C2	653.9333	508.8000	482.7833	402.5000
C3	360.9667	676.0333	312.1000	753.9667

TABLE 18. ANALYSIS OF VARIANCE - TOTAL-FREEZING

SOURCE	MS	DF	F
CONST (A)	767902.000	1.	4.884
NV-FRN (B)	64626.000	1.	0.411
INTEN (C)	89579.000	2.	0.570
FREQ (D)	40869.750	4.	0.260
A x B	189072.000	1.	1.203
A x C	304577.500	2.	1.937
A x C	94860.250	4.	0.603
B x C	48263.500	2.	0.307
B x C	376285.750	4.	2.393
C x C	90856.750	8.	0.578
A x B x C	58064.000	2.	0.369
A x B x D	118692.000	4.	0.755
A x C x D	214409.750	8.	1.364
B x C x D	102077.375	8.	0.649
A x B x C x D	162604.875	8.	1.034
ERROR	157225.432	300.	

TABLE 19. MEANS - MEAN MOVEMENT IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
D1 C1	653.3000	594.5667	455.1667	741.9167
C2	876.9333	680.7500	496.1000	746.1833
C3	792.5667	667.8000	533.1667	477.1667
D2 C1	674.0667	349.1667	746.9833	785.3666
C2	539.6000	645.7667	836.2333	679.4833
C3	767.5333	393.7333	1010.5000	786.5833
D3 C1	629.8500	661.2833	655.9333	550.8667
C2	916.6333	714.7833	570.6500	874.6333
C3	917.5333	596.1167	682.2333	530.9167
D4 C1	1000.9833	501.2667	964.3833	523.6167
C2	867.3333	662.7000	641.7500	759.0167
C3	309.7833	651.5333	815.0333	736.3667
D5 C1	580.9500	665.4000	973.7833	633.6667
C2	544.0667	691.2000	717.2167	797.5000
C3	839.0333	523.9667	687.9000	466.0333

TABLE 20. ANALYSIS OF VARIANCE - MEAN MOVEMENT IN BLACK

SOURCE	MS	DF	F
CONST (A)	491820.000	1.	4.380
BV-FRM (B)	89348.000	1.	0.566
INTEN (C)	105289.000	2.	0.667
FREQ (D)	37023.500	4.	0.234
A X B	152188.000	1.	0.964
A X C	275114.000	2.	1.742
A X D	78435.000	4.	0.497
B X C	44190.000	2.	0.280
B X D	419636.000	4.	2.657
C X D	72807.250	8.	0.461
A X B X C	70915.000	2.	0.449
A X B X D	116602.000	4.	0.738
A X C X D	204157.250	8.	1.293
B X C X D	108227.750	8.	0.685
A X B X C X D	153390.000	8.	0.971
ERROR	157934.078	300.	

TABLE 21. MEANS - MEAN FREEZING IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
D1 C1	363.3000	370.5833	715.8833	388.6833
C2	509.0333	567.8000	556.4667	366.7833
C3	591.6667	404.4667	645.8833	417.0000
D2 C1	466.2000	474.2000	580.3500	256.1000
C2	747.5667	394.0833	767.3500	399.7333
C3	620.5833	531.7833	503.4667	525.4500
D3 C1	581.1833	398.9500	749.3833	372.2167
C2	665.5833	364.1000	494.8833	638.1000
C3	595.0000	596.2667	375.2333	650.3667
D4 C1	711.8500	410.0667	465.0333	365.2167
C2	490.0000	478.1500	438.3333	491.3000
C3	622.8000	597.2333	450.6500	475.2833
D5 C1	318.1833	456.1667	594.5833	343.5667
C2	607.2000	606.3667	517.3667	419.0500
C3	666.2833	534.5500	596.3833	587.6167

TABLE 22. ANALYSIS OF VARIANCE - MEAN FREEZING IN BLACK

SOURCE	MS	DF	F
CONST (A)	981386.000	1.	18.029
BV-FRM (B)	33740.000	1.	0.620
INTEN (C)	204115.000	2.	3.750
FREQ (D)	26760.250	4.	0.492
A X B	14990.000	1.	0.275
A X C	137584.500	2.	2.528
A X D	58858.000	4.	1.081
B X C	54591.500	2.	1.003
B X D	58697.500	4.	1.078
C X D	34115.250	8.	0.627
A X B X C	199639.500	2.	3.668
A X B X D	116525.500	4.	2.141
A X C X D	101776.000	8.	1.870
B X C X D	51655.750	8.	0.949
A X B X C X D	46550.375	8.	0.855
ERROR	54433.203	300.	

TABLE 23. MEANS - MEAN MOVEMENT IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
D1 C1	7.1667	9.0000	4.5000	8.3333
C2	4.1667	6.5000	7.0000	11.0000
C3	7.0000	7.3333	5.6667	16.5000
D2 C1	7.1667	7.6667	3.6667	13.5000
C2	1.5000	13.0000	3.8333	9.8333
C3	4.3333	8.6667	4.0000	7.8333
D3 C1	9.3333	13.5000	2.3333	13.3333
C2	2.8333	13.8333	7.0000	3.6667
C3	4.5000	11.3333	11.0000	3.8333
D4 C1	0.6667	12.0000	8.0000	9.6667
C2	9.3333	9.3333	8.0000	6.6667
C3	4.1667	6.1667	3.1667	4.1667
D5 C1	10.1667	8.5000	6.8333	13.0000
C2	3.8333	7.0000	5.3333	7.5000
C3	5.1667	5.6667	4.0000	5.8333

TABLE 24. ANALYSIS OF VARIANCE - MEAN MOVEMENT IN WHITE

SOURCE	MS	DF	F
CONST (A)	1177.225	1.	35.339
BV-FRM (B)	0.336	1.	0.010
INTEN (C)	114.969	2.	3.451
FREQ (D)	23.801	4.	0.714
A X B	6.136	1.	0.184
A X C	44.508	2.	1.336
A X D	43.454	4.	1.304
B X C	1.186	2.	0.036
B X D	43.607	4.	1.309
C X D	55.883	8.	1.678
A X B X C	102.003	2.	3.062
A X B X D	109.060	4.	3.274
A X C X D	44.894	8.	1.348
B X C X D	30.072	8.	0.903
A X B X C X D	77.291	8.	2.320
ERROR	33.313	300.	

TABLE 25. MEANS - MEAN FREEZING IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
D1 C1	7.5000	9.3333	4.8333	9.1667
C2	4.6667	7.0000	7.5000	11.6667
C3	7.6667	7.8333	4.5000	17.1667
D2 C1	7.6667	8.0000	4.5000	14.0000
C2	2.0000	13.8333	4.5000	10.5000
C3	5.3333	8.8333	4.5000	8.3333
D3 C1	9.6667	14.0000	3.0000	13.8333
C2	3.6667	14.5000	7.5000	4.3333
C3	5.3333	12.0000	11.3333	4.3333
D4 C1	1.5000	12.3333	8.8333	10.1667
C2	10.0000	9.8333	8.3333	7.3333
C3	4.3333	7.0000	3.8333	4.6667
D5 C1	10.5000	9.0000	7.5000	13.5000
C2	4.5000	7.3333	6.1667	8.1667
C3	8.0000	6.0000	4.6667	6.5000

TABLE 26. ANALYSIS OF VARIANCE - MEAN FREEZING IN WHITE

SOURCE	MS	DF	F
CONST (A)	1137.778	1.	33.903
NV-FRM (B)	0.000	1.	0.000
INTEN (C)	105.969	2.	3.158
FREQ (D)	23.572	4.	0.702
A X B	4.011	1.	0.120
A X C	45.636	2.	1.360
A X D	42.861	4.	1.277
B X C	0.608	2.	0.018
B X D	49.819	4.	1.484
C X D	56.508	8.	1.684
A X B X C	96.419	2.	2.873
A X B X D	111.719	4.	3.329
A X C X D	43.126	8.	1.285
B X C X D	29.751	8.	0.886
A X B X C X D	72.847	8.	2.171
ERROR	33.560	300.	

TABLE 27. MEANS - TIME IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
D1 C1	14.6667	18.3333	5.3333	17.5000
C2	8.8333	13.5000	14.5000	22.6667
C3	14.6667	15.1667	12.1667	33.6667
D2 C1	14.8333	15.6667	8.1667	27.5000
C2	3.5000	26.8333	8.3333	20.3333
C3	9.6667	17.5000	8.5000	16.1667
D3 C1	19.0000	27.5000	5.3333	27.1667
C2	6.5000	28.3333	14.5000	8.0000
C3	9.8333	23.3333	22.3333	8.1667
D4 C1	2.1667	24.3333	16.8333	19.8333
C2	19.3333	19.1667	16.3333	14.0000
C3	8.5000	13.1667	7.0000	8.8333
D5 C1	20.6667	17.5000	14.3333	26.5000
C2	8.3333	14.3333	11.5000	15.6667
C3	11.1667	11.6667	8.6667	12.3333

TABLE 28. ANALYSIS OF VARIANCE - TIME IN BLACK

SOURCE	MS	DF	F
CONST (A)	4629.669	1.	34.684
NV-FRM (B)	0.336	1.	0.003
INTEN (C)	441.644	2.	3.309
FREQ (D)	94.736	4.	0.710
A X B	20.069	1.	0.150
A X C	180.145	2.	1.350
A X D	172.447	4.	1.292
B X C	3.245	2.	0.024
B X D	186.614	4.	1.398
C X D	224.655	8.	1.683
A X B X C	396.744	2.	2.972
A X B X D	441.514	4.	3.308
A X C X D	175.662	8.	1.316
B X C X D	119.554	8.	0.896
A X B X C X D	299.824	8.	2.246
ERROR	133.482	300.	

TABLE 29. MEANS - TIME IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
D1 C1	19.7833	16.2167	14.4000	16.5500
C2	12.2667	9.8333	12.3167	14.8333
C3	12.5333	14.5833	15.7333	15.7000
D2 C1	14.4333	18.6833	13.7333	16.3833
C2	11.3833	13.5667	6.5000	14.4500
C3	14.7500	13.4667	10.1000	13.7167
D3 C1	10.2333	13.6833	8.3833	17.6167
C2	6.6000	13.1833	19.1500	11.8000
C3	14.0833	11.9000	14.1333	18.6167
D4 C1	4.6667	16.4500	13.3667	19.4000
C2	12.9333	10.9333	14.9000	14.1667
C3	11.8000	11.2667	18.5333	17.2167
D5 C1	16.7333	15.3167	13.6667	14.7000
C2	11.8667	13.4333	13.0333	19.1833
C3	12.3333	16.2500	12.5667	14.7833

TABLE 30. ANALYSIS OF VARIANCE - TIME IN WHITE

SOURCE	MS	DF	F
CONST (A)	350.148	1.	5.415
NV-FRM (B)	146.513	1.	2.266
INTEN (C)	119.747	2.	1.852
FREQ (D)	32.270	4.	0.499
A X B	33.906	1.	0.524
A X C	38.192	2.	0.591
A X D	28.556	4.	0.442
B X C	48.962	2.	0.757
B X D	97.312	4.	1.505
C X D	54.865	8.	0.849
A X B X C	3.356	2.	0.052
A X B X D	29.627	4.	0.458
A X C X D	48.411	8.	0.749
B X C X D	18.972	8.	0.293
A X B X C X D	59.318	8.	0.917
ERROR	64.658	300.	

TABLE 31. MEANS - CROSSES TO BLACK

		A1 B1	A2 B1	A1 B2	A2 B2
D1	C1	17.4500	11.0500	114.2333	9.4167
	C2	8.9667	13.9000	32.7667	9.7167
	C3	9.6833	15.5000	33.4500	17.8333
D2	C1	19.7333	16.5667	33.3667	10.3833
	C2	59.7667	9.6167	25.5333	10.8000
	C3	7.7833	17.8000	4.8667	10.6833
D3	C1	25.2833	9.7667	41.0500	30.7500
	C2	32.6833	15.0167	12.2167	31.6833
	C3	14.7333	38.2333	11.0167	16.6500
D4	C1	8.9500	14.6833	16.8000	12.3667
	C2	13.6167	12.1833	11.4667	9.3667
	C3	24.8500	39.9167	17.5833	10.8667
D5	C1	11.3833	14.3833	11.1833	22.3667
	C2	51.9833	20.3000	21.3333	11.1000
	C3	21.5833	15.8167	23.8667	76.7500

TABLE 32. ANALYSIS OF VARIANCE - CROSSES TO BLACK

SOURCE	MS	DF	F
CONST (A)	3375.359	1.	1.722
BV-FRM (B)	1172.701	1.	0.598
INTEN (C)	104.578	2.	0.053
FREQ (D)	1114.051	4.	0.568
A x B	316.621	1.	0.161
A x C	5222.813	2.	2.664
A x D	2337.715	4.	1.192
B x C	3534.068	2.	1.802
B x D	2634.333	4.	1.344
C x D	2097.325	8.	1.070
A x B x C	2472.627	2.	1.261
A x B x D	3851.078	4.	1.964
A x C x D	1550.699	8.	0.791
B x C x D	1476.274	8.	0.753
A x B x C x D	953.630	8.	0.486
ERROR	1960.693	300.	

TABLE 33. MEANS - CROSSES TO WHITE

		A1 B1	A2 B1	A1 B2	A2 B2
D1	C1	17.4333	20.3000	10.3000	17.1167
	C2	20.5000	13.0333	21.0167	17.3167
	C3	11.8833	17.2000	11.5000	11.7000
D2	C1	19.1667	13.9833	16.9667	22.0833
	C2	12.3833	14.6667	13.4167	13.7667
	C3	8.5667	12.9833	18.5667	12.5667
D3	C1	12.7167	13.2167	11.1500	17.5667
	C2	13.0667	17.6000	5.4167	11.4500
	C3	14.3667	9.0000	18.4333	8.0000
D4	C1	20.0167	14.1667	15.8667	19.6333
	C2	16.3500	16.7000	16.4333	13.7833
	C3	14.8500	16.9000	17.0667	11.3167
D5	C1	24.9167	15.0167	13.2333	16.8167
	C2	10.0833	11.6833	17.8667	19.9667
	C3	12.4333	12.6000	16.5500	12.3833

TABLE 34. ANALYSIS OF VARIANCE - CROSSES TO WHITE

SOURCE	MS	DF	F
CONST (A)	19.696	1.	0.311
BV-FRM (B)	5.672	1.	0.090
INTEN (C)	355.118	2.	5.609
FREQ (D)	133.369	4.	2.106
A x B	2.790	1.	0.044
A x C	39.053	2.	0.617
A x D	20.967	4.	0.331
B x C	17.646	2.	0.279
B x D	62.544	4.	0.988
C x D	40.524	8.	0.640
A x B x C	373.068	2.	5.892
A x B x D	15.686	4.	0.248
A x C x D	102.039	8.	1.612
B x C x D	116.295	8.	1.837
A x B x C x D	16.137	8.	0.255
ERROR	63.314	300.	

TABLE 35. MEANS - TOTAL CROSSES

		A1 B1	A2 B1	A1 B2	A2 B2
D1	C1	13.9167	10.5667	22.9833	18.4333
	C2	16.7167	10.8500	10.0333	12.6500
	C3	23.7833	8.4500	12.4000	6.8000
D2	C1	5.8000	11.9000	13.4000	11.3333
	C2	9.8833	16.5500	44.4667	9.9667
	C3	21.4167	9.7500	16.2000	16.5167
D3	C1	12.3833	12.3667	13.1000	9.2167
	C2	14.8333	12.5000	10.8000	12.0500
	C3	20.6333	8.7500	10.8000	15.1500
D4	C1	37.2667	10.9000	17.2333	8.7500
	C2	12.9333	12.2333	11.3833	13.9667
	C3	9.4000	14.3000	11.2667	11.6333
D5	C1	9.0167	15.9500	78.6500	8.7167
	C2	11.2500	12.6500	12.7833	15.0333
	C3	26.7000	7.8000	22.1167	9.0667

TABLE 36. ANALYSIS OF VARIANCE - TOTAL CROSSES

SOURCE	MS	DF	F
CONST (A)	3831.924	1.	6.660
BV-FRM (B)	468.658	1.	0.815
INTEN (C)	412.556	2.	0.717
FREQ (D)	453.753	4.	0.789
A x B	323.839	1.	0.563
A x C	523.850	2.	0.910
A x D	472.692	4.	0.822
B x C	365.173	2.	0.635
B x D	564.795	4.	0.982
C x D	524.165	8.	0.911
A x B x C	826.896	2.	1.437
A x B x D	767.408	4.	1.334
A x C x D	603.955	8.	1.050
B x C x D	635.653	8.	1.10[illegible]
A x B x C x D	1004.645	8.	1.74[illegible]
ERROR	575.359	300.	

TABLE 37. MEANS - PERCENTAGE-FREEZING IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
D1 C1	35.0000	27.0167	45.1333	16.0333
C2	24.6833	28.5333	54.9500	21.6833
C3	20.7333	31.0333	50.5000	33.2833
D2 C1	40.4000	42.2500	33.7333	15.6833
C2	53.5500	22.5667	52.6667	22.5833
C3	12.8333	48.4333	14.4667	23.6000
D3 C1	48.5833	24.4500	61.4000	33.3667
C2	32.2500	25.3500	25.1333	25.7667
C3	21.6833	37.7667	21.9500	42.5833
D4 C1	20.1667	28.4167	24.8667	29.0333
C2	30.2833	31.8500	25.3500	23.1333
C3	61.7833	45.9333	32.3667	24.2167
D5 C1	27.1167	33.1333	18.6667	28.5333
C2	43.8667	32.0667	36.4167	14.5333
C3	27.2000	36.9333	35.4500	49.5333

TABLE 38. ANALYSIS OF VARIANCE - PERCENTAGE-FREEZING IN BLACK

SOURCE	MS	DF	F
CONST (A)	1912.680	1.	2.853
NV-FRD (B)	310.141	1.	0.463
INTER (C)	176.752	2.	0.264
FREQ (D)	43.268	4.	0.065
A X B	1867.820	1.	2.786
A X C	3265.564	2.	4.872
A X D	402.361	4.	0.600
B X C	8.740	2.	0.013
B X D	1142.466	4.	1.704
C X D	1153.250	8.	1.720
A X B X C	6.646	2.	0.010
A X B X D	719.698	4.	1.074
A X C X D	1542.501	8.	2.301
B X C X D	880.503	8.	1.314
A X B X C X D	150.626	8.	0.225
ERROR	670.340	300.	

TABLE 39. MEANS - PERCENTAGE-FREEZING IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
D1 C1	34.5500	22.2000	32.5333	35.0833
C2	42.8500	28.9500	21.8667	31.8667
C3	48.8833	20.1667	34.3167	24.2833
D2 C1	26.8667	28.3000	32.7833	21.4667
C2	33.3667	27.3167	50.5667	24.5833
C3	52.2333	19.9500	42.3500	40.4667
D3 C1	31.7500	35.0833	34.4833	18.2500
C2	42.0333	28.0333	28.3500	39.6000
C3	52.0000	24.9833	27.2500	39.4333
D4 C1	51.4500	24.3833	35.1000	17.4500
C2	40.6167	30.2500	27.6167	33.6000
C3	10.6833	36.5000	33.5500	36.3833
D5 C1	19.4500	40.6833	54.0167	14.7167
C2	36.6500	34.6500	31.3333	32.6167
C3	57.9333	24.4167	33.2333	24.7000

TABLE 40. ANALYSIS OF VARIANCE - PERCENTAGE-FREEZING IN WHITE

SOURCE	MS	DF	F
CONST (A)	5568.750	1.	12.605
NV-FRD (B)	243.867	1.	0.515
INTER (C)	389.375	2.	0.822
FREQ (D)	77.589	4.	0.164
A X B	443.105	1.	0.936
A X C	318.943	2.	0.674
A X D	228.741	4.	0.483
B X C	9.316	2.	0.020
B X D	210.837	4.	0.445
C X D	200.556	8.	0.424
A X B X C	2148.209	2.	4.537
A X B X D	685.055	4.	1.447
A X C X D	861.008	8.	1.818
B X C X D	404.197	8.	0.854
A X B X C X D	997.688	8.	2.107
ERROR	473.535	300.	

APPENDIX J

Summaries of the means and of the analyses of variance of retention test two measures (collapsed over frequency).

Parameter identification key:

Constancy

A1 - Constant current
A2 - Constant voltage

Waveform

B1 - Sine wave
B2 - Square wave

Intensity

C1 - 5 db
C2 - 10 db
C3 - 15 db

TABLE 1. MEANS - MOVEMENT IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
C1	284.0033	411.1033	190.4167	374.4833
C2	210.2067	295.5300	270.0500	274.5800
C3	243.1166	296.9633	248.5267	353.0233

TABLE 2. ANALYSIS OF VARIANCE - MOVEMENT IN BLACK

SOURCE	MS	DF	F
CONST (A)	782257.000	1.	17.555
NV-FRM (B)	2265.250	1.	0.051
INTEN (C)	82583.250	2.	1.860
A X B	1760.250	1.	0.040
A X C	96262.250	2.	2.160
B X C	82286.125	2.	1.847
A X B X C	45387.875	2.	1.019
ERROR	44561.246	348.	

TABLE 3. MEANS - FREEZING IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
C1	208.1667	234.5600	250.3333	178.4300
C2	238.4800	225.4300	277.5600	154.0567
C3	203.3867	336.4066	205.7067	247.5633

TABLE 4. ANALYSIS OF VARIANCE - FREEZING IN BLACK

SOURCE	MS	DF	F
CONST (A)	90.750	1.	0.001
NV-FRP (B)	42781.500	1.	0.550
INTEN (C)	31478.125	2.	0.405
A X B	227855.750	1.	2.930
A X C	190295.750	2.	2.447
B X C	10855.500	2.	0.140
A X B X C	892.000	2.	0.011
ERROR	77765.800	348.	

TABLE 5. MEANS - MOVEMENT IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
C1	427.8533	366.9033	387.7366	479.5600
C2	385.9166	422.3700	315.4700	462.4266
C3	309.4100	370.1766	435.5500	315.8333

TABLE 6. ANALYSIS OF VARIANCE - MOVEMENT IN WHITE

SOURCE	MS	DF	F
CONST (A)	22792.000	1.	0.417
NV-FRP (B)	75715.000	1.	1.386
INTEN (C)	124995.250	2.	2.289
A X B	1228.000	1.	0.022
A X C	62323.250	2.	1.141
B X C	4493.750	2.	0.082
A X B X C	218627.000	2.	4.003
ERROR	54611.638	348.	

TABLE 7. MEANS - FREEZING IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
C1	279.9766	187.4333	371.5133	167.5267
C2	367.3566	256.6700	276.9200	308.5366
C3	415.8800	196.4533	310.2166	283.5800

TABLE 8. ANALYSIS OF VARIANCE - FREEZING IN WHITE

SOURCE	MS	DF	F
CONST (A)	965086.500	1.	14.857
NV-FRP (B)	595.750	1.	0.009
INTEN (C)	101631.000	2.	1.565
A X B	125499.250	1.	1.932
A X C	97478.500	2.	1.501
B X C	25706.375	2.	0.396
A X B X C	199612.250	2.	3.073
ERROR	64959.759	348.	

TABLE 9. MEANS - NO. MOVEMENTS IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
C1	18.8333	26.8333	13.2667	22.6000
C2	14.0667	22.0000	15.8667	17.6000
C3	15.5000	22.6667	16.1000	20.9333

TABLE 10. ANALYSIS OF VARIANCE - NO. MOVEMENTS IN BLACK

SOURCE	MS	DF	F
CONST (A)	3204.100	1.	23.655
MV-FRM (B)	246.678	1.	1.821
INTEN (C)	113.244	2.	0.836
A X B	360.000	1.	2.658
A X C	238.033	2.	1.757
B X C	229.478	2.	1.694
A X B X C	282.634	2.	2.087
ERROR	135.450	348.	

TABLE 11. MEANS - NO. FREEZING IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
C1	10.8667	15.9000	7.4333	10.0667
C2	8.8667	11.8000	12.7667	9.0333
C3	9.7000	14.0333	9.6000	12.3333

TABLE 12. ANALYSIS OF VARIANCE - NO. FREEZING IN BLACK

SOURCE	MS	DF	F
CONST (A)	485.344	1.	4.039
MV-FRM (B)	246.678	1.	2.053
INTEN (C)	19.300	2.	0.161
A X B	284.444	1.	2.367
A X C	167.411	2.	1.393
B X C	215.644	2.	1.795
A X B X C	55.645	2.	0.463
ERROR	120.158	348.	

TABLE 13. MEANS - NO. MOVEMENTS IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
C1	23.4000	24.6667	21.9333	25.0000
C2	27.9667	27.0000	22.4000	29.1333
C3	23.4000	22.7333	29.3333	24.7333

TABLE 14. ANALYSIS OF VARIANCE - NO. MOVEMENTS IN WHITE

SOURCE	MS	DF	F
CONST (A)	116.736	1.	0.586
MV-FRM (B)	4.668	1.	0.023
INTEN (C)	246.225	2.	1.236
A X B	143.137	1.	0.718
A X C	92.770	2.	0.466
B X C	102.704	2.	0.516
A X B X C	150.936	2.	0.758
ERROR	199.221	348.	

TABLE 15. MEANS - NO. FREEZING IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
C1	16.1667	14.3333	18.4667	12.9000
C2	23.2000	16.6000	15.8333	20.9000
C3	18.0667	14.5667	19.3667	16.6000

TABLE 16. ANALYSIS OF VARIANCE - NO. FREEZING IN WHITE

SOURCE	MS	DF	F
CONST (A)	577.600	1.	3.557
MV-FRM (B)	3.211	1.	0.020
INTEN (C)	404.233	2.	2.490
A X B	187.778	1.	1.156
A X C	72.634	2.	0.447
B X C	78.145	2.	0.481
A X B X C	470.811	2.	2.900
ERROR	162.371	348.	

TABLE 17. MEANS - TOTAL-FREEZING

	A1 B1	A2 B1	A1 B2	A2 B2
C1	492.1700	645.6633	440.7500	552.9133
C2	446.6866	520.9600	547.6100	478.6300
C3	446.5033	633.3699	454.2333	600.5866

TABLE 18. ANALYSIS OF VARIANCE - TOTAL-FREEZING

SOURCE	MS	DF	F
CCAST (A)	767909.000	1.	4.926
BV-FRM (B)	64630.000	1.	0.415
INTER (C)	89578.000	2.	0.575
A x B	189058.000	1.	1.213
A x C	304572.000	2.	1.954
B x C	48259.500	2.	0.310
A x B x C	58072.500	2.	0.373
ERROR	155890.971	348.	

TABLE 19. MEANS - MEAN MOVEMENT IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
C1	707.8299	554.3366	755.2566	647.0866
C2	753.3133	679.0400	652.3400	771.3633
C3	725.2899	566.6300	745.7666	549.4133

TABLE 20. ANALYSIS OF VARIANCE - MEAN MOVEMENT IN BLACK

SOURCE	MS	DF	F
CCAST (A)	691826.000	1.	4.434
BV-FRM (B)	89358.000	1.	0.573
INTER (C)	105284.000	2.	0.675
A x B	152184.000	1.	0.975
A x C	275105.000	2.	1.763
B x C	44181.000	2.	0.283
A x B x C	70931.000	2.	0.455
ERROR	156022.068	348.	

TABLE 21. MEANS - MEAN FREEZING IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
C1	488.1433	421.9933	621.8400	345.5566
C2	603.8766	482.1000	554.4800	462.5933
C3	615.2666	532.8600	515.5233	531.1433

TABLE 22. ANALYSIS OF VARIANCE - MEAN FREEZING IN BLACK

SOURCE	MS	DF	F
CCAST (A)	981388.000	1.	17.745
BV-FRM (B)	33744.000	1.	0.610
INTER (C)	204113.500	2.	3.691
A x B	14978.000	1.	0.271
A x C	137581.500	2.	2.488
B x C	54587.500	2.	0.987
A x B x C	199646.000	2.	3.610
ERROR	55304.928	348.	

TABLE 23. MEANS - MEAN MOVEMENT IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
C1	6.5000	10.1333	5.6667	11.5667
C2	4.3333	9.9333	6.2333	7.7333
C3	5.0333	7.8333	5.5667	7.6333

TABLE 24. ANALYSIS OF VARIANCE - MEAN MOVEMENT IN WHITE

SOURCE	MS	DF	F
CCAST (A)	1177.225	1.	32.673
BV-FRM (B)	0.336	1.	0.009
INTER (C)	114.969	2.	3.191
A x B	6.136	1.	0.170
A x C	44.508	2.	1.235
B x C	1.186	2.	0.033
A x B x C	102.003	2.	2.831
ERROR	36.031	348.	

TABLE 25. MEANS - MEAN FREEZING IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
C1	7.3667	10.5333	5.7333	12.1333
C2	4.5667	10.5000	6.8000	8.4000
C3	5.2333	8.3333	6.1667	8.2000

TABLE 26. ANALYSIS OF VARIANCE - MEAN FREEZING IN WHITE

SOURCE	MS	DF	F
CONST (A)	1137.778	1.	31.430
NV-FRM (B)	0.000	1.	0.000
INTEN (C)	105.969	2.	2.927
A x B	4.011	1.	0.111
A x C	45.636	2.	1.261
B x C	0.608	2.	0.017
A x B x C	96.419	2.	2.663
ERROR	36.200	348.	

TABLE 27. MEANS - TIME IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
C1	14.2667	20.5667	10.8000	23.7000
C2	5.3000	20.4333	13.0333	16.1333
C3	10.7667	16.1667	11.7333	15.8333

TABLE 28. ANALYSIS OF VARIANCE - TIME IN BLACK

SOURCE	MS	DF	F
CONST (A)	4629.669	1.	32.105
NV-FRM (B)	0.336	1.	0.002
INTEN (C)	441.644	2.	3.063
A x B	20.069	1.	0.139
A x C	180.145	2.	1.249
B x C	3.245	2.	0.023
A x B x C	396.744	2.	2.751
ERROR	144.205	348.	

TABLE 29. MEANS - TIME IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
C1	13.1700	16.0700	12.7100	16.1300
C2	11.0100	12.1900	12.3800	14.8867
C3	13.1000	13.0533	14.1733	16.0067

TABLE 30. ANALYSIS OF VARIANCE - TIME IN WHITE

SOURCE	MS	DF	F
CONST (A)	350.151	1.	5.641
NV-FRM (B)	146.516	1.	2.360
INTEN (C)	119.747	2.	1.929
A x B	33.897	1.	0.546
A x C	38.189	2.	0.615
B x C	48.960	2.	0.789
A x B x C	3.360	2.	0.054
ERROR	62.072	348.	

TABLE 31. MEANS - CROSSES TO BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
C1	16.5600	13.2900	43.3267	17.0567
C2	33.4033	14.2033	20.6633	14.5333
C3	15.7267	25.4533	18.1567	26.5567

TABLE 32. ANALYSIS OF VARIANCE - CROSSES TO BLACK

SOURCE	MS	DF	F
CONST (A)	3375.371	1.	1.736
NV-FRM (B)	1172.717	1.	0.603
INTEN (C)	104.580	2.	0.054
A x B	316.594	1.	0.163
A x C	5222.802	2.	2.686
B x C	3534.056	2.	1.818
A x B x C	2472.644	2.	1.272
ERROR	1944.196	348.	

TABLE 33. MEANS - CROSSES TO WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
C1	18.8500	15.3367	14.3033	18.6433
C2	14.4767	14.7367	15.6300	15.2567
C3	12.4700	13.7367	16.0233	11.1933

TABLE 34. ANALYSIS OF VARIANCE - CROSSES TO WHITE

SOURCE	MS	DF	F
CONST (A)	19.700	1.	0.310
BV-FRP (B)	5.676	1.	0.089
INTER (C)	355.117	2.	5.586
A X B	2.782	1.	0.044
A X C	39.049	2.	0.614
B X C	17.642	2.	0.277
A X B X C	373.073	2.	5.868
ERROR	63.576	348.	

TABLE 35. MEANS - TOTAL CROSSES

	A1 B1	A2 B1	A1 B2	A2 B2
C1	16.4767	12.3367	29.0733	11.2900
C2	13.1233	12.9567	17.8533	12.7333
C3	19.3867	9.8100	14.5567	12.2333

TABLE 36. ANALYSIS OF VARIANCE - TOTAL CROSSES

SOURCE	MS	DF	F
CONST (A)	3831.928	1.	6.544
BV-FRP (B)	468.662	1.	0.800
INTER (C)	412.556	2.	0.704
A X B	323.831	1.	0.553
A X C	523.846	2.	0.895
B X C	365.169	2.	0.624
A X B X C	826.901	2.	1.412
ERROR	585.602	348.	

TABLE 37. MEANS - PERCENTAGE-FREEZING IN BLACK

	A1 B1	A2 B1	A1 B2	A2 B2
C1	34.3333	31.0533	36.7600	24.5300
C2	36.9267	28.8733	39.7033	21.5400
C3	28.8467	40.0200	31.7467	34.6433

TABLE 38. ANALYSIS OF VARIANCE - PERCENTAGE-FREEZING IN BLACK

SOURCE	MS	DF	F
CONST (A)	1912.707	1.	2.772
BV-FRN (B)	310.168	1.	0.449
INTER (C)	176.752	2.	0.256
A X B	1867.758	1.	2.707
A X C	3265.543	2.	4.732
B X C	8.719	2.	0.013
A X B X C	6.682	2.	0.010
ERROR	690.081	348.	

TABLE 39. MEANS - PERCENTAGE-FREEZING IN WHITE

	A1 B1	A2 B1	A1 B2	A2 B2
C1	32.8133	30.1300	38.5833	21.3933
C2	35.1033	29.8400	31.5467	32.4533
C3	44.3467	25.2033	34.1400	33.0533

TABLE 40. ANALYSIS OF VARIANCE - PERCENTAGE-FREEZING IN WHITE

SOURCE	MS	DF	F
CONST (A)	5968.770	1.	12.469
BV-FRN (B)	243.898	1.	0.510
INTER (C)	389.379	2.	0.813
A X B	443.043	1.	0.926
A X C	318.920	2.	0.666
B X C	9.289	2.	0.019
A X B X C	2148.248	2.	4.488
ERROR	478.670	348.	

APPENDIX K

Summaries of the means and of the analyses of variance of the inter-retention test measures.

Parameter identification key:

Constancy

A1 - Constant current
A2 - Constant voltage

Waveform

B1 - Sine wave
B2 - Square wave

Intensity

C1 - 5 db
C2 - 10 db
C3 - 15 db

Frequency

D1 - 60 Hz
D2 - 120 Hz
D3 - 240 Hz
D4 - 480 Hz
D5 - 960 Hz

Time

E1 - Retention Test 1
E2 - Retention Test 2

TABLE 1. MEANS - MOVEMENT IN BLACK

				E1	E2
D1	C1	B1	A1	379.900	425.483
			A2	565.283	401.633
		B2	A1	194.433	192.650
			A2	362.133	359.950
	C2	B1	A1	285.150	305.633
			A2	476.217	232.933
		B2	A1	279.133	279.167
			A2	369.083	326.400
	C3	B1	A1	196.567	370.783
			A2	187.017	296.917
		B2	A1	121.033	269.200
			A2	291.817	462.867
D2	C1	B1	A1	224.550	272.833
			A2	592.833	506.383
		B2	A1	299.317	336.550
			A2	289.667	327.467
	C2	B1	A1	125.983	210.800
			A2	419.950	387.567
		B2	A1	140.333	118.483
			A2	189.850	348.017
	C3	B1	A1	211.083	242.567
			A2	400.767	383.600
		B2	A1	83.117	119.833
			A2	155.650	286.517
D3	C1	B1	A1	277.950	224.350
			A2	298.333	379.267
		B2	A1	222.790	159.017
			A2	341.317	413.600
	C2	B1	A1	89.350	129.250
			A2	334.533	313.017
		B2	A1	347.833	383.133
			A2	121.350	109.933
	C3	B1	A1	133.750	141.550
			A2	232.467	240.633
		B2	A1	304.183	352.000
			A2	191.600	338.650
D4	C1	B1	A1	132.483	37.533
			A2	419.400	431.367
		B2	A1	115.850	158.333
			A2	261.917	418.950
	C2	B1	A1	289.467	184.267
			A2	521.783	314.017
		B2	A1	228.817	376.533
			A2	284.750	286.350
	C3	B1	A1	173.083	347.200
			A2	108.833	229.667
		B2	A1	286.683	262.333
			A2	267.767	357.983
D5	C1	B1	A1	214.733	300.767
			A2	256.867	336.867
		B2	A1	139.033	179.217
			A2	182.333	352.450
	C2	B1	A1	76.950	203.533
			A2	313.600	230.117
		B2	A1	100.500	192.933
			A2	220.583	302.200
	C3	B1	A1	[illegible]65.950	216.400
			A2	351.033	334.000
		B2	A1	121.317	239.262
			A2	158.383	319.100

TABLE 2. ANALYSIS OF VARIANCE - MOVEMENT IN BLACK

BETWEEN SUBJECTS	24572326.500	359.		
CONSTANCY	1777724.500	1.	1777724.500	30.163
WAVEFORM	148879.500	1.	148879.500	2.526
INTENSITY	344901.500	2.	172450.750	2.926
FREQUENCY	593575.500	4.	148393.875	2.518
CONSTANCY x WAVEFORM	156827.500	1.	156827.500	2.661
CONSTANCY x INTENSITY	250994.000	2.	125497.000	2.129
CONSTANCY x FREQUENCY	243984.000	4.	60996.000	1.035
WAVEFORM x INTENSITY	156292.000	2.	78146.000	1.326
WAVEFORM x FREQUENCY	465477.500	4.	116369.375	1.974
INTENSITY x FREQUENCY	531750.500	8.	66468.813	1.128
CONSTANCY x WAVEFORM x INTENSITY	196083.500	2.	98041.750	1.663
CONSTANCY x WAVEFORM x FREQUENCY	488934.500	4.	122233.625	2.074
CONSTANCY x INTENSITY x FREQUENCY	517915.500	8.	64739.438	1.098
WAVEFORM x INTENSITY x FREQUENCY	337558.500	8.	42194.813	0.716
CONSTANCY x WAVEFORM x INTENSITY x FREQUENCY	680316.500	8.	85039.563	1.443
ERROR TERM	17681111.500	300.	58937.038	
WITHIN SUBJECTS	8876873.000	360.		
TIME	240224.000	1.	240224.000	10.039
CONSTANCY x TIME	6752.500	1.	6752.500	0.282
TIME x WAVEFORM	148119.000	1.	148119.000	6.190
TIME x INTENSITY	212852.000	2.	106426.000	4.447
TIME x FREQUENCY	74011.500	4.	18502.875	0.773
CONSTANCY x TIME x WAVEFORM	152278.000	1.	152278.000	6.364
CONSTANCY x TIME x INTENSITY	96146.000	2.	48073.000	2.009
CONSTANCY x TIME x FREQUENCY	79603.000	4.	19900.750	0.832
TIME x WAVEFORM x INTENSITY	14863.000	2.	7431.500	0.311
TIME x WAVEFORM x FREQUENCY	17537.000	4.	4384.250	0.183
TIME x INTENSITY x FREQUENCY	227403.000	8.	28425.375	1.188
CONSTANCY x TIME x WAVEFORM x INTENSITY	1906.000	2.	953.000	0.040
CONSTANCY x TIME x WAVEFORM x FREQUENCY	44538.000	4.	11134.500	0.465
CONSTANCY x TIME x INTENSITY x FREQUENCY	125198.000	8.	15649.750	0.654
TIME x WAVEFORM x INTENSITY x FREQUENCY	215000.500	8.	26875.063	1.123
[illegible] x TIME x WAVEFORM x INTENSITY x FREQUENCY	41473.500	8.	5184.188	0.217
ERROR TERM	7178962.500	300.	23929.875	

TABLE 3. MEANS - MEAN MOVEMENT IN BLACK

	E1	E2
D1 C1 B1 A1	19.083	19.783
A2	29.150	16.217
B2 A1	18.750	14.400
A2	16.450	16.550
C2 B1 A1	9.117	12.267
A2	15.917	9.833
B2 A1	14.117	17.317
A2	14.200	14.833
C3 B1 A1	12.917	12.533
A2	8.167	14.583
B2 A1	7.883	15.733
A2	11.500	15.700
D2 C1 B1 A1	11.283	14.433
A2	20.283	19.083
B2 A1	12.150	13.733
A2	14.950	10.383
C2 B1 A1	6.783	11.383
A2	16.900	13.567
B2 A1	10.867	6.500
A2	11.100	14.450
C3 B1 A1	10.817	14.750
A2	16.167	13.467
B2 A1	8.767	10.100
A2	10.083	13.717
D3 C1 B1 A1	13.083	10.233
A2	14.900	13.683
B2 A1	11.950	8.383
A2	14.633	17.617
C2 B1 A1	17.250	6.600
A2	14.283	13.183
B2 A1	21.583	15.150
A2	9.283	11.800
C3 B1 A1	13.200	14.083
A2	15.150	11.900
B2 A1	17.383	14.133
A2	10.133	18.617
D4 C1 B1 A1	7.050	4.667
A2	22.283	16.450
B2 A1	7.983	13.367
A2	14.617	15.400
C2 B1 A1	13.300	12.933
A2	37.367	10.933
B2 A1	13.900	14.900
A2	17.500	14.167
C3 B1 A1	5.633	11.800
A2	8.700	11.267
B2 A1	13.567	18.533
A2	12.583	17.217
D5 C1 B1 A1	9.933	16.733
A2	12.783	15.317
B2 A1	12.450	13.667
A2	10.133	14.700
C2 B1 A1	9.283	11.867
A2	13.767	13.433
B2 A1	6.700	13.033
A2	11.533	19.183
C3 B1 A1	6.200	12.133
A2	16.950	14.250
B2 A1	8.967	12.367
A2	11.133	14.783

TABLE 4. ANALYSIS OF VARIANCE - MEAN MOVEMENT IN BLACK

BETWEEN SUBJECTS	36093.988	359.		
CONSTANCY	1312.637	1.	1312.637	13.868
WAVEFORM	17.066	1.	17.066	0.180
INTENSITY	493.594	2.	246.797	2.607
FREQUENCY	369.959	4.	92.490	0.977
CONSTANCY X WAVEFORM	228.230	1.	228.230	2.411
CONSTANCY X INTENSITY	197.340	2.	98.670	1.042
CONSTANCY X FREQUENCY	496.510	4.	124.127	1.311
WAVEFORM X INTENSITY	120.793	2.	60.396	0.638
WAVEFORM X FREQUENCY	224.260	4.	56.065	0.592
INTENSITY X FREQUENCY	1777.916	8.	222.240	2.348
CONSTANCY X WAVEFORM X INTENSITY	114.234	2.	57.117	0.603
CONSTANCY X WAVEFORM X FREQUENCY	267.479	4.	66.870	0.706
CONSTANCY X INTENSITY X FREQUENCY	831.229	8.	103.904	1.098
WAVEFORM X INTENSITY X FREQUENCY	811.193	8.	101.399	1.071
CONSTANCY X WAVEFORM X INTENSITY X FREQUENCY	426.775	8.	53.347	0.564
ERROR TERM	28394.773	300.	94.649	
WITHIN SUBJECTS	26420.570	360.		
TIME	26.734	1.	26.734	0.377
CONSTANCY X TIME	95.268	1.	95.268	1.343
TIME X WAVEFORM	450.313	1.	450.313	6.350
TIME X INTENSITY	662.898	2.	331.449	4.674
TIME X FREQUENCY	474.580	4.	118.645	1.673
CONSTANCY X TIME X WAVEFORM	545.625	1.	545.625	7.694
CONSTANCY X TIME X INTENSITY	10.613	2.	5.307	0.075
CONSTANCY X TIME X FREQUENCY	640.463	4.	160.116	2.258
TIME X WAVEFORM X INTENSITY	28.684	2.	14.342	0.202
TIME X WAVEFORM X FREQUENCY	182.389	4.	45.597	0.643
TIME X INTENSITY X FREQUENCY	912.705	8.	114.088	1.609
CONSTANCY X TIME X WAVEFORM X INTENSITY	79.910	2.	39.955	0.563
CONSTANCY X TIME X WAVEFORM X FREQUENCY	28.072	4.	7.018	0.099
CONSTANCY X TIME X INTENSITY X FREQUENCY	486.002	8.	60.750	0.857
TIME X WAVEFORM X INTENSITY X FREQUENCY	733.525	8.	41.691	0.588
CONSTANCY X TIME X WAVEFORM X INTENSITY X FREQUENCY	587.584	8.	73.448	1.036
ERROR TERM	21275.223	300.	70.917	

TABLE 5. MEANS - NO. MOVEMENTS IN BLACK

	E1	E2
D1 C1 B1 A1	21.500	18.333
A2	21.000	25.333
B2 A1	12.500	16.167
A2	24.500	17.333
C2 B1 A1	19.833	13.667
A2	27.667	18.333
B2 A1	20.000	23.833
A2	26.833	27.667
C3 B1 A1	18.500	18.667
A2	11.833	18.667
B2 A1	10.667	20.167
A2	20.500	25.667
D2 C1 B1 A1	18.000	19.833
A2	31.833	30.000
B2 A1	11.333	11.833
A2	20.500	20.500
C2 B1 A1	14.833	11.167
A2	20.000	27.000
B2 A1	11.833	15.333
A2	13.833	23.667
C3 B1 A1	14.333	8.833
A2	20.667	34.500
B2 A1	7.833	9.833
A2	10.833	18.833
D3 C1 B1 A1	18.000	21.333
A2	19.667	26.833
B2 A1	15.333	14.333
A2	23.000	23.833
C2 B1 A1	7.000	7.667
A2	23.000	24.167
B2 A1	20.333	22.333
A2	12.000	8.333
C3 B1 A1	8.333	11.833
A2	13.833	21.167
B2 A1	24.667	23.167
A2	17.833	21.000
D4 C1 B1 A1	21.000	7.500
A2	19.000	29.333
B2 A1	12.500	13.000
A2	19.333	27.833
C2 B1 A1	13.000	17.000
A2	21.667	24.167
B2 A1	16.833	22.500
A2	19.500	18.333
C3 B1 A1	17.167	20.667
A2	8.333	18.167
B2 A1	16.167	9.833
A2	17.667	19.500
D5 C1 B1 A1	22.333	28.167
A2	19.833	22.667
B2 A1	9.667	11.000
A2	16.500	23.500
C2 B1 A1	17.500	20.833
A2	21.500	19.333
B2 A1	9.333	15.333
A2	16.833	19.000
C3 B1 A1	19.333	13.500
A2	22.500	22.833
B2 A1	11.833	17.500
A2	8.833	20.667

TABLE 6. ANALYSIS OF VARIANCE - NO. MOVEMENTS IN BLACK

BETWEEN SUBJECTS	72292.662	359.		
CONSTANCY	4692.006	1.	4692.006	26.614
WAVEFORM	688.355	1.	688.355	3.905
INTENSITY	876.877	2.	438.438	2.487
FREQUENCY	508.037	4.	127.009	0.720
CONSTANCY X WAVEFORM	259.199	1.	259.199	1.470
CONSTANCY X INTENSITY	344.678	2.	172.339	0.978
CONSTANCY X FREQUENCY	1226.229	4.	306.557	1.739
WAVEFORM X INTENSITY	703.479	2.	351.739	1.995
WAVEFORM X FREQUENCY	2154.936	4.	538.734	3.056
INTENSITY X FREQUENCY	908.789	8.	113.599	0.644
CONSTANCY X WAVEFORM X INTENSITY	1226.637	2.	613.318	3.479
CONSTANCY X WAVEFORM X FREQUENCY	1537.121	4.	384.280	2.180
CONSTANCY X INTENSITY X FREQUENCY	1058.549	8.	132.319	0.751
WAVEFORM X INTENSITY X FREQUENCY	1010.855	8.	126.357	0.717
CONSTANCY X WAVEFORM X INTENSITY X FREQUENCY	2207.586	8.	275.948	1.565
ERROR TERM	52889.336	300.	176.298	
WITHIN SUBJECTS	30226.000	360.		
TIME	806.449	1.	806.449	9.926
CONSTANCY X TIME	133.473	1.	133.473	1.643
TIME X WAVEFORM	16.201	1.	16.201	0.199
TIME X INTENSITY	248.701	2.	124.351	1.530
TIME X FREQUENCY	157.564	4.	39.391	0.485
CONSTANCY X TIME X WAVEFORM	115.201	1.	115.201	1.418
CONSTANCY X TIME X INTENSITY	425.547	2.	212.773	2.619
CONSTANCY X TIME X FREQUENCY	328.406	4.	82.102	1.010
TIME X WAVEFORM X INTENSITY	31.033	2.	15.517	0.191
TIME X WAVEFORM X FREQUENCY	472.729	4.	118.182	1.455
TIME X INTENSITY X FREQUENCY	621.246	8.	77.656	0.956
CONSTANCY X TIME X WAVEFORM X INTENSITY	39.432	2.	19.716	0.243
CONSTANCY X TIME X WAVEFORM X FREQUENCY	261.865	4.	65.466	0.806
CONSTANCY X TIME X INTENSITY X FREQUENCY	975.445	8.	121.931	1.501
TIME X WAVEFORM X INTENSITY X FREQUENCY	949.914	8.	118.739	1.461
CONSTANCY X TIME X WAVEFORM X INTENSITY X FREQUENCY	268.125	8.	33.516	0.413
ERROR TERM	24374.666	300.	81.249	

TABLE 7. MEANS - MOVEMENT IN WHITE

				E1	E2
D1	C1	B1	A1	469.017	411.217
			A2	407.167	427.783
		B2	A1	331.783	210.967
			A2	333.100	451.167
	C2	B1	A1	315.067	470.733
			A2	277.633	399.267
		B2	A1	326.150	364.367
			A2	351.217	506.817
	C3	B1	A1	476.500	331.383
			A2	365.150	458.617
		B2	A1	217.083	280.917
			A2	248.367	320.133
D2	C1	B1	A1	400.283	460.967
			A2	375.650	219.617
		B2	A1	257.733	433.283
			A2	436.750	618.433
	C2	B1	A1	353.233	250.600
			A2	442.633	418.350
		B2	A1	231.033	314.167
			A2	300.283	457.250
	C3	B1	A1	269.383	242.333
			A2	265.467	284.517
		B2	A1	420.817	576.700
			A2	429.367	355.233
D3	C1	B1	A1	190.517	354.467
			A2	605.683	471.783
		B2	A1	110.383	251.600
			A2	222.033	414.183
	C2	B1	A1	255.617	448.650
			A2	543.117	577.883
		B2	A1	321.467	371.583
			A2	339.417	451.567
	C3	B1	A1	309.817	400.283
			A2	347.483	363.150
		B2	A1	258.667	408.767
			A2	305.883	216.983
D4	C1	B1	A1	97.167	409.817
			A2	461.717	350.567
		B2	A1	398.250	576.633
			A2	442.200	411.833
	C2	B1	A1	314.050	458.683
			A2	350.117	407.633
		B2	A1	467.167	387.133
			A2	344.217	422.350
	C3	B1	A1	156.800	265.917
			A2	331.967	373.100
		B2	A1	297.250	487.017
			A2	344.583	306.733
D5	C1	B1	A1	432.000	463.800
			A2	356.250	406.967
		B2	A1	531.300	476.200
			A2	416.967	501.983
	C2	B1	A1	454.633	254.917
			A2	332.733	363.517
		B2	A1	389.500	489.700
			A2	294.633	474.750
	C3	B1	A1	314.267	319.133
			A2	439.367	331.450
		B2	A1	392.283	304.350
			A2	309.067	291.283

TABLE 8. ANALYSIS OF VARIANCE - MOVEMENT IN WHITE

BETWEEN SUBJECTS	28568637.000	359.		
CONSTANCY	281295.000	1.	281295.000	3.572
WAVEFORM	13863.000	1.	13863.000	0.176
INTENSITY	275502.000	2.	137751.000	1.749
FREQUENCY	89685.000	4.	22421.250	0.285
CONSTANCY X WAVEFORM	45456.000	1.	45456.000	0.577
CONSTANCY X INTENSITY	84860.000	2.	42430.000	0.539
CONSTANCY X FREQUENCY	263007.000	4.	65751.750	0.835
WAVEFORM X INTENSITY	2831.000	2.	1415.500	0.018
WAVEFORM X FREQUENCY	1150799.000	4.	287699.750	3.654
INTENSITY X FREQUENCY	382102.000	8.	47762.750	0.607
CONSTANCY X WAVEFORM X INTENSITY	229022.000	2.	114511.000	1.454
CONSTANCY X WAVEFORM X FREQUENCY	252009.000	4.	63002.250	0.800
CONSTANCY X INTENSITY X FREQUENCY	754862.000	8.	94357.750	1.198
WAVEFORM X INTENSITY X FREQUENCY	709930.000	8.	88741.250	1.127
CONSTANCY X WAVEFORM X INTENSITY X FREQUENCY	410984.000	8.	51373.000	0.652
ERROR TERM	23622433.000	300.	78741.442	
WITHIN SUBJECTS	10899302.000	360.		
TIME	454250.000	1.	454250.000	16.419
CONSTANCY X TIME	100470.000	1.	100470.000	3.631
TIME X WAVEFORM	73710.000	1.	73710.000	2.664
TIME X INTENSITY	53622.000	2.	26811.000	0.969
TIME X FREQUENCY	120758.000	4.	30189.500	1.091
CONSTANCY X TIME X WAVEFORM	69974.000	1.	69974.000	2.529
CONSTANCY X TIME X INTENSITY	86933.000	2.	43466.500	1.571
CONSTANCY X TIME X FREQUENCY	481676.000	4.	120419.000	4.352
TIME X WAVEFORM X INTENSITY	6861.000	2.	3430.500	0.124
TIME X WAVEFORM X FREQUENCY	84686.000	4.	21171.500	0.765
TIME X INTENSITY X FREQUENCY	124737.000	8.	15592.125	0.564
CONSTANCY X TIME X WAVEFORM X INTENSITY	211639.000	2.	105819.500	3.825
CONSTANCY X TIME X WAVEFORM X FREQUENCY	29772.000	4.	7443.000	0.269
CONSTANCY X TIME X INTENSITY X FREQUENCY	207781.000	8.	25972.625	0.939
TIME X WAVEFORM X INTENSITY X FREQUENCY	312888.000	8.	39111.000	1.414
CONSTANCY X TIME X WAVEFORM X INTENSITY X FREQUENCY	179532.000	8.	22441.500	0.811
ERROR TERM	8300022.000	300.	27666.740	

TABLE 9. MEANS - MEAN MOVEMENT IN WHITE

				E1	E2
D1	C1	B1	A1	19.433	17.433
			A2	20.867	20.300
		B2	A1	15.217	10.300
			A2	11.600	17.117
	C2	B1	A1	13.017	20.900
			A2	9.133	13.033
		B2	A1	18.367	21.017
			A2	17.167	17.317
	C3	B1	A1	18.200	11.883
			A2	34.383	17.200
		B2	A1	12.017	11.500
			A2	17.983	11.700
D2	C1	B1	A1	16.383	19.167
			A2	20.750	13.983
		B2	A1	13.800	16.967
			A2	16.483	22.083
	C2	B1	A1	10.100	12.183
			A2	17.833	14.667
		B2	A1	13.683	13.417
			A2	11.067	13.767
	C3	B1	A1	16.517	8.567
			A2	13.267	12.983
		B2	A1	16.050	18.567
			A2	15.850	12.567
D3	C1	B1	A1	9.750	12.717
			A2	32.017	13.217
		B2	A1	9.150	11.190
			A2	18.267	17.567
	C2	B1	A1	9.433	13.067
			A2	18.683	17.600
		B2	A1	14.383	9.417
			A2	16.583	11.450
	C3	B1	A1	11.667	14.367
			A2	14.367	9.000
		B2	A1	13.800	16.433
			A2	19.017	8.000
D4	C1	B1	A1	5.300	20.017
			A2	17.817	14.167
		B2	A1	19.700	19.867
			A2	21.683	19.633
	C2	B1	A1	12.917	16.350
			A2	26.233	16.700
		B2	A1	19.267	16.433
			A2	15.583	13.783
	C3	B1	A1	9.367	14.850
			A2	21.533	16.900
		B2	A1	15.867	17.067
			A2	15.117	11.317
D5	C1	B1	A1	18.033	24.917
			A2	15.867	15.017
		B2	A1	21.567	13.233
			A2	16.917	16.817
	C2	B1	A1	17.400	10.083
			A2	13.783	11.683
		B2	A1	16.517	17.867
			A2	14.017	15.967
	C3	B1	A1	14.167	12.433
			A2	17.917	12.600
		B2	A1	19.433	16.550
			A2	17.533	17.183

TABLE 10. ANALYSIS OF VARIANCE - MEAN MOVEMENT IN WHITE

BETWEEN SUBJECTS	66068.674	359.		
CONSTANCY	506.379	1.	506.379	4.038
WAVEFORM	24.914	1.	24.814	0.199
INTENSITY	556.407	2.	278.403	2.229
FREQUENCY	841.791	4.	210.448	1.685
CONSTANCY x WAVEFORM	347.189	1.	347.189	2.780
CONSTANCY x INTENSITY	60.928	2.	30.464	0.244
CONSTANCY x FREQUENCY	521.090	4.	130.272	1.043
WAVEFORM x INTENSITY	88.762	2.	44.381	0.355
WAVEFORM x FREQUENCY	475.506	4.	118.876	0.952
INTENSITY x FREQUENCY	426.445	8.	53.306	0.427
CONSTANCY x WAVEFORM x INTENSITY	346.367	2.	173.184	1.387
CONSTANCY x WAVEFORM x FREQUENCY	362.207	4.	90.552	0.725
CONSTANCY x INTENSITY x FREQUENCY	1783.102	8.	222.888	1.785
WAVEFORM x INTENSITY x FREQUENCY	1962.658	8.	245.332	1.964
CONSTANCY x WAVEFORM x INTENSITY x FREQUENCY	276.939	8.	34.617	0.277
ERROR TERM	37469.691	300.	124.899	
WITHIN SUBJECTS	28997.196	360.		
TIME	141.633	1.	141.633	1.842
CONSTANCY x TIME	824.371	1.	824.371	10.722
TIME x WAVEFORM	68.707	1.	68.707	0.894
TIME x INTENSITY	282.115	2.	141.058	1.835
TIME x FREQUENCY	127.305	4.	31.826	0.414
CONSTANCY x TIME x WAVEFORM	442.736	1.	442.736	5.758
CONSTANCY x TIME x INTENSITY	126.096	2.	63.048	0.820
CONSTANCY x TIME x FREQUENCY	604.424	4.	151.106	1.965
TIME x WAVEFORM x INTENSITY	5.488	2.	2.744	0.036
TIME x WAVEFORM x FREQUENCY	86.617	4.	21.654	0.282
TIME x INTENSITY x FREQUENCY	705.160	8.	88.145	1.146
CONSTANCY x TIME x WAVEFORM x INTENSITY	400.770	2.	200.385	2.606
CONSTANCY x TIME x WAVEFORM x FREQUENCY	90.762	4.	22.690	0.295
CONSTANCY x TIME x INTENSITY x FREQUENCY	542.219	8.	67.777	0.882
TIME x WAVEFORM x INTENSITY x FREQUENCY	1353.240	8.	169.155	2.200
CONSTANCY x TIME x WAVEFORM x INTENSITY x FREQUENCY	130.018	8.	16.252	0.211
ERROR TERM	23065.486	300.	76.885	

TABLE 11. MEANS - NO. MOVEMENTS IN WHITE

				E1	E2
D1	C1	B1	A1	20.667	26.333
			A2	21.000	25.000
		B2	A1	19.167	13.500
			A2	23.333	25.333
	C2	B1	A1	22.167	24.833
			A2	17.667	25.833
		B2	A1	20.167	15.667
			A2	20.333	30.167
	C3	B1	A1	21.333	27.000
			A2	26.000	24.667
		B2	A1	17.500	21.333
			A2	18.000	26.667
D2	C1	B1	A1	22.333	25.333
			A2	16.667	16.833
		B2	A1	15.000	22.667
			A2	27.500	29.167
	C2	B1	A1	8.333	20.000
			A2	25.167	26.500
		B2	A1	16.833	21.833
			A2	27.000	28.000
	C3	B1	A1	18.667	24.167
			A2	15.167	16.833
		B2	A1	26.000	30.833
			A2	27.333	28.667
D3	C1	B1	A1	13.000	25.833
			A2	23.667	32.500
		B2	A1	13.167	22.000
			A2	20.667	24.500
	C2	B1	A1	23.000	30.167
			A2	32.833	30.000
		B2	A1	26.333	24.500
			A2	19.000	33.000
	C3	B1	A1	22.667	22.667
			A2	18.167	28.167
		B2	A1	19.833	24.333
			A2	18.000	18.500
D4	C1	B1	A1	17.667	20.500
			A2	22.500	24.333
		B2	A1	22.333	31.833
			A2	24.167	21.500
	C2	B1	A1	21.000	17.000
			A2	20.833	22.500
		B2	A1	28.667	23.833
			A2	18.333	26.167
	C3	B1	A1	14.833	11.167
			A2	19.500	22.333
		B2	A1	19.000	29.000
			A2	23.000	28.500
D5	C1	B1	A1	26.833	21.000
			A2	23.833	26.667
		B2	A1	25.000	29.667
			A2	22.833	24.500
	C2	B1	A1	24.833	22.833
			A2	25.167	26.167
		B2	A1	22.833	22.167
			A2	15.833	24.333
	C3	B1	A1	19.333	26.000
			A2	21.167	21.667
		B2	A1	24.167	17.167
			A2	16.333	19.333

TABLE 12. ANALYSIS OF VARIANCE - NO. MOVEMENTS IN WHITE

BETWEEN SUBJECTS	87748.270	359.		
CONSTANCY	241.512	1.	241.512	0.951
WAVEFORM	6.613	1.	6.613	0.026
INTENSITY	524.590	2.	262.295	1.032
FREQUENCY	322.789	4.	80.697	0.318
CONSTANCY x WAVEFORM	66.203	1.	66.203	0.253
CONSTANCY x INTENSITY	279.156	2.	139.578	0.549
CONSTANCY x FREQUENCY	398.626	4.	99.606	0.392
WAVEFORM x INTENSITY	250.305	2.	125.152	0.493
WAVEFORM x FREQUENCY	2570.129	4.	642.532	2.529
INTENSITY x FREQUENCY	1256.245	8.	156.786	0.617
CONSTANCY x WAVEFORM x INTENSITY	8.645	2.	4.322	0.017
CONSTANCY x WAVEFORM x FREQUENCY	1197.016	4.	299.254	1.178
CONSTANCY x INTENSITY x FREQUENCY	2363.391	8.	297.569	1.171
WAVEFORM x INTENSITY x FREQUENCY	1376.516	8.	136.566	0.530
CONSTANCY x WAVEFORM x INTENSITY x FREQUENCY	960.117	8.	120.015	0.472
ERROR TERM	76213.585	300.	254.045	
WITHIN SUBJECTS	41456.500	360.		
TIME	3120.436	1.	3120.436	27.966
CONSTANCY x TIME	0.070	1.	0.070	0.001
TIME x WAVEFORM	0.234	1.	0.234	0.002
TIME x INTENSITY	88.285	2.	44.143	0.395
TIME x FREQUENCY	574.547	4.	143.637	1.286
CONSTANCY x TIME x WAVEFORM	79.336	1.	79.336	0.710
CONSTANCY x TIME x INTENSITY	181.672	2.	90.836	0.813
CONSTANCY x TIME x FREQUENCY	577.895	4.	144.474	1.294
TIME x WAVEFORM x INTENSITY	35.790	2.	17.895	0.160
TIME x WAVEFORM x FREQUENCY	95.652	4.	23.913	0.214
TIME x INTENSITY x FREQUENCY	376.145	8.	47.018	0.421
CONSTANCY x TIME x WAVEFORM x INTENSITY	476.492	2.	238.246	2.133
CONSTANCY x TIME x WAVEFORM x FREQUENCY	81.027	4.	20.257	0.181
CONSTANCY x TIME x INTENSITY x FREQUENCY	439.598	8.	54.950	0.492
TIME x WAVEFORM x INTENSITY x FREQUENCY	1257.461	8.	157.183	1.407
CONSTANCY x TIME x WAVEFORM x INTENSITY x FREQUENCY	966.967	8.	120.858	1.082
ERROR TERM	33502.582	300.	111.675	

TABLE 13. MEANS - FREEZING IN BLACK

				E1	E2
D1	C1	B1	A1	259.383	121.217
			A2	142.150	203.800
		B2	A1	226.000	475.683
			A2	296.650	98.133
	C2	B1	A1	255.967	102.833
			A2	447.550	286.317
		B2	A1	334.467	424.733
			A2	334.550	127.417
	C3	B1	A1	216.333	130.483
			A2	44.133	239.283
		B2	A1	534.650	397.633
			A2	303.533	259.967
D2	C1	B1	A1	274.917	253.100
			A2	275.133	344.450
		B2	A1	215.463	766.650
			A2	147.200	87.167
	C2	B1	A1	549.683	464.567
			A2	127.100	166.667
		B2	A1	594.317	245.283
			A2	208.750	172.500
	C3	B1	A1	331.650	95.383
			A2	458.300	422.667
		B2	A1	108.167	69.667
			A2	61.550	126.900
D3	C1	B1	A1	580.933	345.800
			A2	142.350	159.450
		B2	A1	678.567	385.050
			A2	351.983	235.533
	C2	B1	A1	167.283	197.600
			A2	57.583	172.700
		B2	A1	273.150	246.717
			A2	354.817	219.433
	C3	B1	A1	254.300	85.750
			A2	331.000	161.250
		B2	A1	[illegible]	165.767
			A2	[illegible]	[illegible]
D4	C1	B1	A1	[illegible]	[illegible]
			A2	[illegible]	267.367
		B2	A1	[illegible]	77.283
			A2	[illegible]	257.433
	C2	B1	A1	454.850	121.350
			A2	[illegible]	[illegible]
		B2	A1	147.017	141.717
			A2	[illegible]	154.633
	C3	B1	A1	[illegible]	[illegible]
			A2	[illegible]	318.200
		B2	A1	[illegible]	162.633
			A2	275.283	105.650
D5	C1	B1	A1	148.967	201.033
			A2	299.933	197.733
		B2	A1	69.333	47.000
			A2	356.133	213.883
	C2	B1	A1	221.000	296.050
			A2	155.750	278.683
		B2	A1	100.017	289.850
			A2	477.950	100.300
	C3	B1	A1	158.917	146.383
			A2	204.733	342.033
		B2	A1	289.200	272.833
			A2	391.833	419.867

TABLE 14. ANALYSIS OF VARIANCE - FREEZING IN BLACK

BETWEEN SUBJECTS	44435727.000	359.		
CONSTANCY	175162.500	1.	175162.500	1.469
WAVEFORM	221.000	1.	221.000	0.002
INTENSITY	56340.500	2.	28170.250	0.236
FREQUENCY	129092.500	4.	32273.125	0.271
CONSTANCY X WAVEFORM	9453.500	1.	9453.500	0.079
CONSTANCY X INTENSITY	194104.500	2.	97052.250	0.814
CONSTANCY X FREQUENCY	545566.500	4.	136391.625	1.144
WAVEFORM X INTENSITY	49728.000	2.	24864.000	0.209
WAVEFORM X FREQUENCY	1665620.500	4.	416405.125	3.492
INTENSITY X FREQUENCY	1316620.000	8.	164577.500	1.380
CONSTANCY X WAVEFORM X INTENSITY	46571.000	2.	23285.500	0.195
CONSTANCY X WAVEFORM X FREQUENCY	1027674.000	4.	256918.500	2.155
CONSTANCY X INTENSITY X FREQUENCY	2170619.500	8.	271329.938	2.276
WAVEFORM X INTENSITY X FREQUENCY	892574.000	8.	111571.750	0.936
CONSTANCY X WAVEFORM X INTENSITY X FREQUENCY	387142.000	8.	48392.750	0.406
ERROR TERM	35769219.000	300.	119230.729	
WITHIN SUBJECTS	22055798.000	360.		
TIME	786607.000	1.	786607.000	13.560
CONSTANCY X TIME	165471.000	1.	165471.000	2.852
TIME X WAVEFORM	78253.500	1.	78253.500	1.349
TIME X INTENSITY	16444.500	2.	8222.250	0.142
TIME X FREQUENCY	142381.500	4.	35595.375	0.614
CONSTANCY X TIME X WAVEFORM	596976.500	1.	596976.500	10.291
CONSTANCY X TIME X INTENSITY	217584.000	2.	108792.000	1.875
CONSTANCY X TIME X FREQUENCY	359796.000	4.	89949.000	1.551
TIME X WAVEFORM X INTENSITY	19121.500	2.	9560.750	0.165
TIME X WAVEFORM X FREQUENCY	79494.500	4.	19873.625	0.343
TIME X INTENSITY X FREQUENCY	366680.000	8.	45835.000	0.790
CONSTANCY X TIME X WAVEFORM X INTENSITY	67695.500	2.	33847.750	0.583
CONSTANCY X TIME X WAVEFORM X FREQUENCY	178063.500	4.	44515.875	0.767
CONSTANCY X TIME X INTENSITY X FREQUENCY	795124.000	8.	99390.500	1.713
TIME X WAVEFORM X INTENSITY X FREQUENCY	435194.000	8.	54399.250	0.938
CONSTANCY X TIME X WAVEFORM X INTENSITY X FREQUENCY	347494.000	8.	43436.750	0.749
ERROR TERM	17403419.000	300.	58011.396	

TABLE 15. MEANS - MEAN FREEZING IN BLACK

	E1	E2
D1 C1 B1 A1	26.017	17.450
A2	15.667	11.050
B2 A1	25.767	114.233
A2	16.917	9.417
C2 B1 A1	14.400	8.967
A2	22.017	13.900
B2 A1	31.933	32.767
A2	32.850	9.717
C3 B1 A1	52.750	9.683
A2	14.100	15.500
B2 A1	63.333	33.450
A2	21.900	17.833
D2 C1 B1 A1	16.533	19.733
A2	12.500	16.567
B2 A1	53.417	36.367
A2	14.933	10.383
C2 B1 A1	75.317	54.767
A2	17.200	9.617
B2 A1	161.600	25.533
A2	18.333	10.800
C3 B1 A1	140.133	7.783
A2	54.317	17.800
B2 A1	26.900	6.867
A2	13.133	10.683
D3 C1 B1 A1	226.117	25.283
A2	13.683	9.767
B2 A1	61.667	41.050
A2	32.583	30.750
C2 B1 A1	26.317	32.683
A2	31.717	15.017
B2 A1	25.150	12.217
A2	30.867	31.683
C3 B1 A1	69.867	14.733
A2	33.883	10.233
B2 A1	20.867	11.017
A2	24.150	16.650
D4 C1 B1 A1	19.383	8.450
A2	9.500	14.683
B2 A1	28.900	16.900
A2	28.217	12.367
C2 B1 A1	36.117	13.617
A2	32.267	12.183
B2 A1	25.483	11.467
A2	57.383	9.367
C3 B1 A1	24.700	24.850
A2	30.383	35.917
B2 A1	19.633	17.583
A2	25.367	10.867
D5 C1 B1 A1	11.150	11.383
A2	16.767	14.183
B2 A1	12.667	11.183
A2	60.533	22.367
C2 B1 A1	62.800	51.483
A2	17.100	20.100
B2 A1	30.367	21.133
A2	54.200	11.100
C3 B1 A1	28.950	21.583
A2	14.417	15.417
B2 A1	72.550	23.667
A2	66.030	76.750

TABLE 16. ANALYSIS OF VARIANCE - MEAN FREEZING IN BLACK

BETWEEN SUBJECTS	2030983.578	359.		
CONSTANCY	40143.166	1.	40143.166	7.161
WAVEFORM	566.965	1.	566.965	0.101
INTENSITY	507.656	2.	253.828	0.045
FREQUENCY	16594.367	4.	4148.592	0.740
CONSTANCY x WAVEFORM	5420.914	1.	5420.914	0.966
CONSTANCY x INTENSITY	6671.469	2.	3335.734	0.595
CONSTANCY x FREQUENCY	36325.203	4.	9081.301	1.620
WAVEFORM x INTENSITY	4196.273	2.	2098.137	0.374
WAVEFORM x FREQUENCY	26110.141	4.	6527.535	1.164
INTENSITY x FREQUENCY	52952.789	8.	6619.099	1.181
CONSTANCY x WAVEFORM x INTENSITY	14.134	2.	7.067	0.001
CONSTANCY x WAVEFORM x FREQUENCY	30589.492	4.	7647.373	1.364
CONSTANCY x INTENSITY x FREQUENCY	61643.672	8.	7705.459	1.375
WAVEFORM x INTENSITY x FREQUENCY	44387.031	8.	5548.379	0.990
CONSTANCY x WAVEFORM x INTENSITY x FREQUENCY	23141.281	8.	2892.660	0.516
ERROR TERM	1681641.109	300.	5605.470	
WITHIN SUBJECTS	1774730.866	360.		
TIME	53688.102	1.	53688.102	11.026
CONSTANCY x TIME	13969.273	1.	13969.273	2.868
TIME x WAVEFORM	608.156	1.	608.156	0.125
TIME x INTENSITY	1087.750	2.	543.875	0.112
TIME x FREQUENCY	16818.461	4.	4204.615	0.863
CONSTANCY x TIME x WAVEFORM	9735.727	1.	9735.727	1.999
CONSTANCY x TIME x INTENSITY	4347.516	2.	2173.758	0.446
CONSTANCY x TIME x FREQUENCY	25634.586	4.	6408.646	1.316
TIME x WAVEFORM x INTENSITY	15306.563	2.	7653.281	1.572
TIME x WAVEFORM x FREQUENCY	14849.070	4.	3712.268	0.762
TIME x INTENSITY x FREQUENCY	43083.844	8.	5385.480	1.106
CONSTANCY x TIME x WAVEFORM x INTENSITY	10599.422	2.	5299.711	1.088
CONSTANCY x TIME x WAVEFORM x FREQUENCY	9893.352	4.	2473.338	0.508
CONSTANCY x TIME x INTENSITY x FREQUENCY	35095.781	8.	4386.973	0.901
TIME x WAVEFORM x INTENSITY x FREQUENCY	36749.688	8.	4593.711	0.943
CONSTANCY x TIME x WAVEFORM x INTENSITY x FREQUENCY	26295.625	8.	3286.953	0.675
ERROR TERM	1460967.969	300.	4869.893	

TABLE 17. MEANS - NO. FREEZING IN BLACK

				E1	E2
D1	C1	B1	A1	11.833	10.333
			A2	7.833	15.500
		B2	A1	9.000	11.333
			A2	17.500	8.000
	C2	B1	A1	12.000	8.667
			A2	19.500	10.833
		B2	A1	11.000	16.167
			A2	17.333	10.833
	C3	B1	A1	11.500	8.667
			A2	9.500	10.500
		B2	A1	7.500	13.500
			A2	11.333	12.333
D2	C1	B1	A1	17.167	11.833
			A2	22.167	21.500
		B2	A1	6.000	7.333
			A2	8.500	6.000
	C2	B1	A1	12.833	8.833
			A2	8.667	13.167
		B2	A1	5.500	10.500
			A2	6.667	12.833
	C3	B1	A1	9.667	9.500
			A2	16.833	25.333
		B2	A1	2.333	5.000
			A2	9.000	10.000
D3	C1	B1	A1	12.667	11.167
			A2	7.667	12.500
		B2	A1	12.833	11.167
			A2	11.667	9.667
	C2	B1	A1	4.000	3.833
			A2	5.000	9.333
		B2	A1	10.667	14.500
			A2	8.167	3.833
	C3	B1	A1	5.500	6.333
			A2	7.000	8.833
		B2	A1	16.000	11.167
			A2	11.667	16.167
D4	C1	B1	A1	17.667	5.833
			A2	7.333	16.500
		B2	A1	7.000	4.000
			A2	7.500	17.167
	C2	B1	A1	9.167	7.000
			A2	9.167	14.000
		B2	A1	8.000	13.667
			A2	11.667	11.000
	C3	B1	A1	14.500	21.667
			A2	5.167	9.000
		B2	A1	10.333	5.667
			A2	8.833	9.333
D5	C1	B1	A1	13.500	15.167
			A2	13.667	13.500
		B2	A1	2.167	3.333
			A2	7.167	5.500
	C2	B1	A1	5.833	16.000
			A2	10.333	11.667
		B2	A1	3.667	9.000
			A2	10.833	6.667
	C3	B1	A1	8.667	7.333
			A2	12.167	16.500
		B2	A1	6.333	12.667
			A2	5.000	11.833

TABLE 18. ANALYSIS OF VARIANCE - NO. FREEZING IN BLACK

BETWEEN SUBJECTS	53228.661	359.		
CONSTANCY	384.271	1.	384.271	2.626
WAVEFORM	551.250	1.	551.250	3.767
INTENSITY	88.286	2.	44.143	0.302
FREQUENCY	276.411	4.	69.103	0.472
CONSTANCY x WAVEFORM	34.673	1.	34.673	0.237
CONSTANCY x INTENSITY	21.270	2.	10.635	0.073
CONSTANCY x FREQUENCY	658.339	4.	164.585	1.125
WAVEFORM x INTENSITY	639.357	2.	319.679	2.185
WAVEFORM x FREQUENCY	2443.805	4.	610.951	4.175
INTENSITY x FREQUENCY	782.380	8.	97.797	0.668
CONSTANCY x WAVEFORM x INTENSITY	78.421	2.	39.210	0.268
CONSTANCY x WAVEFORM x FREQUENCY	710.856	4.	177.714	1.214
CONSTANCY x INTENSITY x FREQUENCY	980.705	8.	122.588	0.838
WAVEFORM x INTENSITY x FREQUENCY	576.422	8.	72.053	0.492
CONSTANCY x WAVEFORM x INTENSITY x FREQUENCY	1101.715	8.	137.714	0.941
ERROR TERM	43900.500	300.	146.335	
WITHIN SUBJECTS	25068.000	360.		
TIME	322.672	1.	322.672	4.692
CONSTANCY x TIME	133.673	1.	133.673	1.944
TIME x WAVEFORM	1.605	1.	1.605	0.023
TIME x INTENSITY	130.920	2.	65.260	0.949
TIME x FREQUENCY	187.161	4.	46.790	0.680
CONSTANCY x TIME x WAVEFORM	322.672	1.	322.672	4.692
CONSTANCY x TIME x INTENSITY	474.103	2.	237.051	3.447
CONSTANCY x TIME x FREQUENCY	442.390	4.	110.597	1.608
TIME x WAVEFORM x INTENSITY	16.870	2.	8.435	0.123
TIME x WAVEFORM x FREQUENCY	116.257	4.	29.064	0.423
TIME x INTENSITY x FREQUENCY	297.564	8.	37.196	0.541
CONSTANCY x TIME x WAVEFORM x INTENSITY	68.419	2.	34.209	0.497
CONSTANCY x TIME x WAVEFORM x FREQUENCY	169.937	4.	42.484	0.618
CONSTANCY x TIME x INTENSITY x FREQUENCY	744.787	8.	93.098	1.354
TIME x WAVEFORM x INTENSITY x FREQUENCY	619.766	8.	77.471	1.126
CONSTANCY x TIME x WAVEFORM x INTENSITY x FREQUENCY	386.635	8.	48.329	0.703
ERROR TERM	20633.167	300.	68.777	

TABLE 19. MEANS - FREEZING IN WHITE

				E1	E2
D1	C1	B1	A1	151.700	262.083
			A2	85.400	166.783
		B2	A1	344.433	244.200
			A2	208.117	290.550
	C2	B1	A1	453.617	406.200
			A2	46.600	281.483
		B2	A1	262.250	131.733
			A2	145.350	235.367
	C3	B1	A1	311.150	461.183
			A2	349.700	164.183
		B2	A1	327.233	252.250
			A2	355.483	157.033
D2	C1	B1	A1	289.850	213.100
			A2	49.017	179.750
		B2	A1	501.233	313.700
			A2	288.383	168.433
	C2	B1	A1	312.233	283.000
			A2	212.317	227.417
		B2	A1	234.317	522.067
			A2	441.117	227.233
	C3	B1	A1	416.650	525.200
			A2	135.467	109.117
		B2	A1	581.900	433.800
			A2	553.433	398.550
D3	C1	B1	A1	144.600	235.383
			A2	185.250	235.500
		B2	A1	188.100	364.333
			A2	212.067	136.683
	C2	B1	A1	500.683	467.983
			A2	214.767	151.900
		B2	A1	257.550	248.667
			A2	382.417	422.667
	C3	B1	A1	508.283	505.250
			A2	287.050	233.017
		B2	A1	235.450	213.467
			A2	326.583	315.433
D4	C1	B1	A1	355.267	552.167
			A2	232.983	247.700
		B2	A1	426.133	387.750
			A2	162.550	111.783
	C2	B1	A1	208.667	364.650
			A2	126.500	254.867
		B2	A1	367.000	254.617
			A2	226.733	330.667
	C3	B1	A1	376.617	63.867
			A2	475.417	276.433
		B2	A1	357.517	326.317
			A2	311.967	369.633
D5	C1	B1	A1	303.033	117.150
			A2	206.950	258.433
		B2	A1	466.133	547.583
			A2	250.567	129.683
	C2	B1	A1	412.833	411.150
			A2	466.417	327.683
		B2	A1	616.183	227.517
			A2	246.813	318.750
	C3	B1	A1	373.567	519.900
			A2	205.667	192.517
		B2	A1	367.200	323.550
			A2	350.717	172.750

TABLE 20. ANALYSIS OF VARIANCE - FREEZING IN WHITE

BETWEEN SUBJECTS	37796449.000	359.		
CONSTANCY	1946636.000	1.	1946636.000	20.012
WAVEFORM	113315.500	1.	113315.500	1.165
INTENSITY	762777.000	2.	381388.500	3.921
FREQUENCY	354872.000	4.	88718.000	0.912
CONSTANCY x WAVEFORM	176127.500	1.	176127.500	1.811
CONSTANCY x INTENSITY	104020.000	2.	52010.000	0.535
CONSTANCY x FREQUENCY	122483.000	4.	30620.750	0.315
WAVEFORM x INTENSITY	185720.500	2.	92860.250	0.955
WAVEFORM x FREQUENCY	752298.000	4.	188074.500	1.933
INTENSITY x FREQUENCY	584968.500	8.	73121.063	0.752
CONSTANCY x WAVEFORM x INTENSITY	568982.500	2.	284491.250	2.925
CONSTANCY x WAVEFORM x FREQUENCY	677326.500	4.	169331.625	1.741
CONSTANCY x INTENSITY x FREQUENCY	902124.000	8.	112765.500	1.159
WAVEFORM x INTENSITY x FREQUENCY	516863.500	8.	64607.938	0.664
CONSTANCY x WAVEFORM x INTENSITY x FREQUENCY	846222.500	8.	105777.813	1.087
ERROR TERM	29182153.000	300.	97273.843	
WITHIN SUBJECTS	19636839.000	360.		
TIME	107020.000	1.	107020.000	1.971
CONSTANCY x TIME	-28.500	1.	-28.500	-0.001
TIME x WAVEFORM	91885.000	1.	91885.000	1.692
TIME x INTENSITY	133872.000	2.	66936.000	1.233
TIME x FREQUENCY	120031.500	4.	30007.875	0.553
CONSTANCY x TIME x WAVEFORM	6669.500	1.	6669.500	0.123
CONSTANCY x TIME x INTENSITY	234542.000	2.	117271.000	2.159
CONSTANCY x TIME x FREQUENCY	73815.000	4.	18453.750	0.340
TIME x WAVEFORM x INTENSITY	12397.500	2.	6198.750	0.114
TIME x WAVEFORM x FREQUENCY	137121.500	4.	34280.375	0.631
TIME x INTENSITY x FREQUENCY	355279.000	8.	44409.875	0.818
CONSTANCY x TIME x WAVEFORM x INTENSITY	31548.500	2.	15774.250	0.290
CONSTANCY x TIME x WAVEFORM x FREQUENCY	174549.500	4.	43637.375	0.804
CONSTANCY x TIME x INTENSITY x FREQUENCY	820308.000	8.	102538.500	1.888
TIME x WAVEFORM x INTENSITY x FREQUENCY	523424.500	8.	65428.063	1.205
CONSTANCY x TIME x WAVEFORM x INTENSITY x FREQUENCY	522189.500	8.	65273.688	1.202
ERROR TERM	16292212.000	300.	54307.373	

TABLE 21. MEANS - MEAN FREEZING IN WHITE

	E1	E2
D1 C1 B1 A1	15.883	13.917
A2	10.317	10.567
B2 A1	20.717	22.983
A2	13.533	18.433
C2 B1 A1	31.967	14.717
A2	4.683	10.850
B2 A1	18.900	10.033
A2	13.167	12.650
C3 B1 A1	14.583	23.783
A2	33.350	8.450
B2 A1	21.817	12.400
A2	45.733	8.800
D2 C1 B1 A1	14.517	9.800
A2	11.033	11.900
B2 A1	31.683	13.400
A2	14.717	11.333
C2 B1 A1	36.683	5.883
A2	13.833	16.550
B2 A1	16.700	44.467
A2	18.433	9.967
C3 B1 A1	40.250	21.417
A2	13.617	5.750
B2 A1	28.617	16.200
A2	53.133	16.517
D3 C1 B1 A1	11.700	12.383
A2	13.083	12.367
B2 A1	5.833	13.100
A2	17.283	5.217
C2 B1 A1	25.100	14.833
A2	13.717	17.500
B2 A1	14.250	10.800
A2	15.833	12.050
C3 B1 A1	14.917	26.633
A2	25.833	8.750
B2 A1	15.350	10.400
A2	31.800	15.150
D4 C1 B1 A1	25.283	37.267
A2	14.317	10.900
B2 A1	22.917	17.233
A2	4.150	8.750
C2 B1 A1	12.067	12.433
A2	13.383	12.233
B2 A1	15.383	11.383
A2	21.233	13.567
C3 B1 A1	14.117	4.400
A2	32.567	14.300
B2 A1	15.233	11.267
A2	18.100	11.633
D5 C1 B1 A1	15.667	4.017
A2	12.650	15.550
B2 A1	24.483	78.650
A2	22.867	8.717
C2 B1 A1	16.767	11.250
A2	25.133	12.650
B2 A1	15.050	17.783
A2	13.433	15.033
C3 B1 A1	19.033	26.700
A2	13.717	7.800
B2 A1	15.967	22.117
A2	22.083	4.067

TABLE 22. ANALYSIS OF VARIANCE - MEAN FREEZING IN WHITE

BETWEEN SUBJECTS	251201.150	359.		
CONSTANCY	3007.670	1.	3007.670	4.296
WAVEFORM	1144.625	1.	1144.625	1.635
INTENSITY	1215.053	2.	607.526	0.868
FREQUENCY	2575.174	4.	643.793	0.920
CONSTANCY x WAVEFORM	54.141	1.	54.141	0.077
CONSTANCY x INTENSITY	2619.289	2.	1309.645	1.871
CONSTANCY x FREQUENCY	2688.660	4.	672.165	0.960
WAVEFORM x INTENSITY	643.584	2.	321.792	0.460
WAVEFORM x FREQUENCY	2704.160	4.	676.040	0.966
INTENSITY x FREQUENCY	5053.277	8.	631.660	0.902
CONSTANCY x WAVEFORM x INTENSITY	2561.625	2.	1280.813	1.829
CONSTANCY x WAVEFORM x FREQUENCY	3457.453	4.	864.363	1.235
CONSTANCY x INTENSITY x FREQUENCY	3794.162	8.	474.270	0.677
WAVEFORM x INTENSITY x FREQUENCY	4026.414	8.	503.302	0.719
CONSTANCY x WAVEFORM x INTENSITY x FREQUENCY	5619.828	8.	702.479	1.003
ERROR TERM	210036.035	300.	700.120	
WITHIN SUBJECTS	189885.008	360.		
TIME	4974.682	1.	4974.682	9.704
CONSTANCY x TIME	1069.199	1.	1069.199	2.086
TIME x WAVEFORM	10.082	1.	10.082	0.020
TIME x INTENSITY	4176.805	2.	2088.402	4.074
TIME x FREQUENCY	1027.787	4.	256.947	0.501
CONSTANCY x TIME x WAVEFORM	1077.992	1.	1077.992	2.103
CONSTANCY x TIME x INTENSITY	2481.115	2.	1240.558	2.420
CONSTANCY x TIME x FREQUENCY	777.064	4.	194.266	0.379
TIME x WAVEFORM x INTENSITY	560.375	2.	280.188	0.547
TIME x WAVEFORM x FREQUENCY	369.523	4.	92.381	0.180
TIME x INTENSITY x FREQUENCY	2747.232	8.	343.404	0.670
CONSTANCY x TIME x WAVEFORM x INTENSITY	78.594	2.	39.297	0.077
CONSTANCY x TIME x WAVEFORM x FREQUENCY	2183.723	4.	545.931	1.065
CONSTANCY x TIME x INTENSITY x FREQUENCY	3971.686	8.	496.461	0.968
TIME x WAVEFORM x INTENSITY x FREQUENCY	3819.973	8.	477.497	0.931
CONSTANCY x TIME x WAVEFORM x INTENSITY x FREQUENCY	6768.926	8.	846.116	1.651
ERROR TERM	153790.230	300.	512.634	

TABLE 21. MEANS -- MEAN FREEZING IN WHITE

	E1	E2
D1 C1 B1 A1	15.283	13.917
A2	10.317	10.567
B2 A1	20.717	22.983
A2	13.533	18.433
C2 B1 A1	31.967	16.717
A2	4.683	10.850
B2 A1	18.900	10.033
A2	13.167	12.650
C3 B1 A1	14.583	23.783
A2	33.350	8.450
B2 A1	21.817	12.400
A2	45.733	8.800
D2 C1 B1 A1	14.517	9.800
A2	11.033	11.900
B2 A1	33.683	13.400
A2	14.717	11.333
C2 B1 A1	36.483	9.883
A2	13.833	16.550
B2 A1	16.200	44.467
A2	18.933	9.967
C3 B1 A1	40.250	21.417
A2	13.617	9.750
B2 A1	28.017	16.200
A2	53.133	16.517
D3 C1 B1 A1	11.700	12.383
A2	13.083	12.367
B2 A1	5.833	13.100
A2	17.283	9.217
C2 B1 A1	25.100	14.833
A2	13.717	17.500
B2 A1	14.250	10.800
A2	19.833	12.050
C3 B1 A1	19.917	26.633
A2	25.833	8.750
B2 A1	15.350	10.800
A2	33.800	15.150
D4 C1 B1 A1	25.283	37.267
A2	14.317	10.900
B2 A1	22.917	17.233
A2	9.150	8.750
C2 B1 A1	12.067	12.933
A2	13.383	12.233
B2 A1	19.383	11.383
A2	21.233	13.967
C3 B1 A1	19.117	4.400
A2	32.567	14.300
B2 A1	19.233	11.267
A2	18.100	11.633
D5 C1 B1 A1	15.667	9.017
A2	12.650	15.550
B2 A1	29.483	78.650
A2	22.867	8.717
C2 B1 A1	18.767	11.250
A2	25.133	12.650
B2 A1	35.050	12.783
A2	13.433	15.033
C3 B1 A1	19.033	26.700
A2	13.717	7.800
B2 A1	15.967	22.117
A2	22.083	9.067

TABLE 22. ANALYSIS OF VARIANCE - MEAN FREEZING IN WHITE

BETWEEN SUBJECTS	251201.150	359.		
CONSTANCY	3007.670	1.	3007.670	4.296
WAVEFORM	1144.625	1.	1144.625	1.635
INTENSITY	1215.053	2.	607.526	0.868
FREQUENCY	2575.174	4.	643.793	0.920
CONSTANCY X WAVEFORM	54.141	1.	54.141	0.077
CONSTANCY X INTENSITY	2619.289	2.	1309.645	1.871
CONSTANCY X FREQUENCY	2688.660	4.	672.165	0.960
WAVEFORM X INTENSITY	643.586	2.	321.792	0.460
WAVEFORM X FREQUENCY	2704.160	4.	676.040	0.966
INTENSITY X FREQUENCY	5053.277	8.	631.660	0.902
CONSTANCY X WAVEFORM X INTENSITY	2561.625	2.	1280.813	1.829
CONSTANCY X WAVEFORM X FREQUENCY	3457.453	4.	864.363	1.235
CONSTANCY X INTENSITY X FREQUENCY	3794.162	8.	474.270	0.677
WAVEFORM X INTENSITY X FREQUENCY	4026.414	8.	503.302	0.719
CONSTANCY X WAVEFORM X INTENSITY X FREQUENCY	5619.928	8.	702.479	1.003
ERROR TERM	210036.035	300.	700.120	
WITHIN SUBJECTS	189885.008	360.		
TIME	4974.692	1.	4974.692	9.704
CONSTANCY X TIME	1069.199	1.	1069.199	2.086
TIME X WAVEFORM	10.082	1.	10.082	0.020
TIME X INTENSITY	4176.805	2.	2088.402	4.074
TIME X FREQUENCY	1027.787	4.	256.947	0.501
CONSTANCY X TIME X WAVEFORM	1077.992	1.	1077.992	2.103
CONSTANCY X TIME X INTENSITY	2481.115	2.	1240.558	2.420
CONSTANCY X TIME X FREQUENCY	777.064	4.	194.266	0.379
TIME X WAVEFORM X INTENSITY	560.375	2.	280.188	0.547
TIME X WAVEFORM X FREQUENCY	369.521	4.	92.381	0.180
TIME X INTENSITY X FREQUENCY	2747.232	8.	343.404	0.670
CONSTANCY X TIME X WAVEFORM X INTENSITY	78.534	2.	39.267	0.077
CONSTANCY X TIME X WAVEFORM X FREQUENCY	2183.723	4.	545.931	1.065
CONSTANCY X TIME X INTENSITY X FREQUENCY	3971.686	8.	496.461	0.968
TIME X WAVEFORM X INTENSITY X FREQUENCY	3819.973	8.	477.497	0.931
CONSTANCY X TIME X WAVEFORM X INTENSITY X FREQUENCY	6764.926	8.	846.116	1.651
ERROR TERM	153790.230	300.	512.634	

TABLE 23. MEANS - NO. FREEZING IN WHITE

				E1	E2
D1	C1	B1	A1	11.500	17.000
			A2	8.333	13.833
		B2	A1	16.167	8.833
			A2	11.833	16.333
	C2	B1	A1	14.833	25.500
			A2	4.833	19.167
		B2	A1	11.667	12.167
			A2	11.833	18.500
	C3	B1	A1	16.833	19.500
			A2	19.167	16.833
		B2	A1	9.667	15.167
			A2	9.167	11.667
D2	C1	B1	A1	16.333	17.667
			A2	4.500	5.000
		B2	A1	12.333	18.500
			A2	16.500	15.167
	C2	B1	A1	6.833	18.000
			A2	19.167	12.667
		B2	A1	10.833	17.667
			A2	20.167	17.500
	C3	B1	A1	14.333	20.167
			A2	5.833	8.000
		B2	A1	20.833	26.333
			A2	21.167	26.333
D3	C1	B1	A1	8.000	16.167
			A2	13.000	18.667
		B2	A1	11.500	19.333
			A2	9.667	16.667
	C2	B1	A1	20.500	26.667
			A2	15.167	15.667
		B2	A1	11.000	17.333
			A2	15.833	28.833
	C3	B1	A1	25.500	23.667
			A2	12.000	16.667
		B2	A1	11.667	17.333
			A2	12.500	14.333
D4	C1	B1	A1	10.333	19.500
			A2	11.500	12.167
		B2	A1	17.167	23.333
			A2	12.667	11.333
	C2	B1	A1	17.500	27.333
			A2	8.500	16.500
		B2	A1	20.333	15.500
			A2	16.833	19.167
	C3	B1	A1	12.833	6.833
			A2	12.500	15.500
		B2	A1	13.833	25.333
			A2	14.833	23.833
D5	C1	B1	A1	18.333	10.500
			A2	18.333	18.000
		B2	A1	18.000	22.333
			A2	13.667	11.000
	C2	B1	A1	23.500	18.500
			A2	14.667	19.000
		B2	A1	17.500	16.500
			A2	10.500	20.500
	C3	B1	A1	14.000	20.167
			A2	11.667	15.833
		B2	A1	18.833	12.667
			A2	12.833	12.833

TABLE 24. ANALYSIS OF VARIANCE - NO. FREEZING IN WHITE

BETWEEN SUBJECTS	68485.112	359.		
CONSTANCY	1142.566	1.	1142.566	5.955
WAVEFORM	30.934	1.	30.934	0.161
INTENSITY	689.535	2.	344.768	1.797
FREQUENCY	463.297	4.	115.824	0.604
CONSTANCY X WAVEFORM	337.570	1.	337.570	1.760
CONSTANCY X INTENSITY	43.537	2.	21.769	0.113
CONSTANCY X FREQUENCY	74.037	4.	18.509	0.096
WAVEFORM X INTENSITY	137.453	2.	68.727	0.358
WAVEFORM X FREQUENCY	2152.326	4.	538.082	2.805
INTENSITY X FREQUENCY	731.604	8.	91.450	0.477
CONSTANCY X WAVEFORM X INTENSITY	785.119	2.	392.560	2.046
CONSTANCY X WAVEFORM X FREQUENCY	680.342	4.	170.085	0.887
CONSTANCY X INTENSITY X FREQUENCY	1331.567	8.	166.446	0.868
WAVEFORM X INTENSITY X FREQUENCY	1138.576	8.	142.322	0.742
CONSTANCY X WAVEFORM X INTENSITY X FREQUENCY	1191.740	8.	148.968	0.776
ERROR TERM	57555.250	300.	191.851	
WITHIN SUBJECTS	35695.500	360.		
TIME	2104.668	1.	2104.668	21.932
CONSTANCY X TIME	0.035	1.	0.035	0.000
TIME X WAVEFORM	9.111	1.	9.111	0.095
TIME X INTENSITY	262.637	2.	131.318	1.368
TIME X FREQUENCY	448.047	4.	112.012	1.167
CONSTANCY X TIME X WAVEFORM	1.010	1.	1.010	0.011
CONSTANCY X TIME X INTENSITY	115.504	2.	57.752	0.602
CONSTANCY X TIME X FREQUENCY	550.711	4.	137.678	1.435
TIME X WAVEFORM X INTENSITY	94.576	2.	47.288	0.493
TIME X WAVEFORM X FREQUENCY	193.854	4.	48.463	0.505
TIME X INTENSITY X FREQUENCY	254.254	8.	31.782	0.331
CONSTANCY X TIME X WAVEFORM X INTENSITY	260.510	2.	130.255	1.357
CONSTANCY X TIME X WAVEFORM X FREQUENCY	110.365	4.	27.591	0.288
CONSTANCY X TIME X INTENSITY X FREQUENCY	744.445	8.	93.056	0.970
TIME X WAVEFORM X INTENSITY X FREQUENCY	1227.818	8.	153.477	1.599
CONSTANCY X TIME X WAVEFORM X INTENSITY X FREQUENCY	529.361	8.	66.170	0.690
ERROR TERM	28788.584	300.	95.962	

TABLE 25. MEANS - TOTAL TIME IN BLACK

				E1	E2
D1	C1	B1	A1	639.283	546.700
			A2	707.433	605.433
		B2	A1	473.783	744.833
			A2	654.783	458.093
	C2	B1	A1	451.117	323.067
			A2	473.767	515.250
		B2	A1	613.600	703.900
			A2	703.433	453.817
	C3	B1	A1	462.250	407.433
			A2	236.150	537.200
		B2	A1	666.683	666.833
			A2	595.750	722.833
D2	C1	B1	A1	503.467	525.933
			A2	844.183	850.833
		B2	A1	441.033	453.017
			A2	476.467	414.633
	C2	B1	A1	734.533	662.400
			A2	547.650	554.233
		B2	A1	734.650	563.767
			A2	394.600	520.517
	C3	B1	A1	513.967	231.433
			A2	859.067	406.267
		B2	A1	191.283	189.500
			A2	217.200	413.417
D3	C1	B1	A1	858.983	526.150
			A2	437.617	538.717
		B2	A1	401.317	544.067
			A2	695.300	649.133
	C2	B1	A1	363.700	283.367
			A2	397.117	485.217
		B2	A1	670.983	629.350
			A2	478.167	325.367
	C3	B1	A1	381.900	282.467
			A2	505.467	603.483
		B2	A1	715.883	517.767
			A2	505.533	665.083
D4	C1	B1	A1	747.567	145.017
			A2	535.300	650.733
		B2	A1	383.617	235.617
			A2	544.850	676.383
	C2	B1	A1	612.283	332.667
			A2	717.383	537.300
		B2	A1	425.613	558.250
			A2	647.050	440.983
	C3	B1	A1	666.583	890.217
			A2	392.617	548.467
		B2	A1	544.833	384.967
			A2	543.050	463.633
D5	C1	B1	A1	464.567	619.050
			A2	556.600	534.600
		B2	A1	208.367	226.217
			A2	538.467	566.333
	C2	B1	A1	332.733	683.933
			A2	469.350	508.800
		B2	A1	200.517	482.783
			A2	648.533	402.500
	C3	B1	A1	511.567	360.467
			A2	555.767	676.033
		B2	A1	410.517	512.100
			A2	540.217	733.567

TABLE 26. ANALYSIS OF VARIANCE - TOTAL TIME IN BLACK

BETWEEN SUBJECTS	80866422.000	359.		
CONSTANCY	824630.000	1.	824630.000	3.680
WAVEFORM	188428.000	1.	188428.000	0.841
INTENSITY	222828.000	2.	111414.000	0.497
FREQUENCY	564512.000	4.	141128.000	0.630
CONSTANCY x WAVEFORM	61954.000	1.	61954.000	0.276
CONSTANCY x INTENSITY	101304.000	2.	50652.000	0.226
CONSTANCY x FREQUENCY	636120.000	4.	159030.000	0.710
WAVEFORM x INTENSITY	254706.000	2.	127353.000	0.568
WAVEFORM x FREQUENCY	3184124.000	4.	796031.000	3.552
INTENSITY x FREQUENCY	1644264.000	8.	205533.000	0.917
CONSTANCY x WAVEFORM x INTENSITY	203166.000	2.	101583.000	0.453
CONSTANCY x WAVEFORM x FREQUENCY	1133226.000	4.	283306.500	1.264
CONSTANCY x INTENSITY x FREQUENCY	2335710.000	8.	291963.750	1.303
WAVEFORM x INTENSITY x FREQUENCY	930932.000	8.	116366.500	0.519
CONSTANCY x WAVEFORM x INTENSITY x FREQUENCY	1357312.000	8.	169664.000	0.757
ERROR TERM	67223602.000	300.	224078.672	
WITHIN SUBJECTS	35531160.000	360.		
TIME	152302.000	1.	152302.000	1.559
CONSTANCY x TIME	109484.000	1.	109484.000	1.121
TIME x WAVEFORM	5336.000	1.	5336.000	0.055
TIME x INTENSITY	294242.000	2.	147121.000	1.506
TIME x FREQUENCY	434734.000	4.	108683.500	1.113
CONSTANCY x TIME x WAVEFORM	133984.000	1.	133984.000	1.372
CONSTANCY x TIME x INTENSITY	629272.000	2.	314636.000	3.221
CONSTANCY x TIME x FREQUENCY	758284.000	4.	189571.000	1.941
TIME x WAVEFORM x INTENSITY	4726.000	2.	2363.000	0.024
TIME x WAVEFORM x FREQUENCY	119914.000	4.	29978.500	0.307
TIME x INTENSITY x FREQUENCY	453014.000	8.	56626.750	0.580
CONSTANCY x TIME x WAVEFORM x INTENSITY	52138.000	2.	26069.000	0.267
CONSTANCY x TIME x WAVEFORM x FREQUENCY	207526.000	4.	51881.500	0.531
CONSTANCY x TIME x INTENSITY x FREQUENCY	1444318.000	8.	180539.750	1.848
TIME x WAVEFORM x INTENSITY x FREQUENCY	954608.000	8.	119326.000	1.222
CONSTANCY x TIME x WAVEFORM x INTENSITY x FREQUENCY	472432.000	8.	59054.000	0.605
ERROR TERM	29304858.000	300.	97682.859	

TABLE 27. MEANS - TOTAL TIME IN WHITE

	E1	E2
D1 C1 B1 A1	560.717	653.100
A2	492.567	554.567
B2 A1	726.217	655.167
A2	541.217	741.917
C2 B1 A1	768.683	676.933
A2	276.233	680.750
B2 A1	588.400	496.100
A2	490.567	746.183
C3 B1 A1	737.750	792.567
A2	963.850	667.800
B2 A1	534.317	513.167
A2	604.250	477.167
D2 C1 B1 A1	698.133	674.067
A2	355.817	549.167
B2 A1	758.967	766.483
A2	723.133	785.367
C2 B1 A1	465.467	535.600
A2	652.950	645.767
B2 A1	465.350	836.233
A2	801.400	479.483
C3 B1 A1	686.033	767.533
A2	340.933	593.733
B2 A1	1608.717	1010.500
A2	982.800	776.583
D3 C1 B1 A1	341.117	675.850
A2	762.383	661.283
B2 A1	298.683	655.933
A2	504.700	550.667
C2 B1 A1	836.300	910.633
A2	807.883	715.783
B2 A1	579.017	570.650
A2	721.833	474.633
C3 B1 A1	818.100	917.533
A2	634.533	550.117
B2 A1	486.117	682.233
A2	834.467	530.917
D4 C1 B1 A1	452.433	1000.983
A2	646.700	501.267
B2 A1	616.393	964.383
A2	655.150	523.617
C2 B1 A1	587.717	867.333
A2	487.617	662.700
B2 A1	774.167	641.750
A2	552.950	759.017
C3 B1 A1	533.417	309.783
A2	807.383	651.933
B2 A1	655.167	815.033
A2	636.950	736.567
D5 C1 B1 A1	735.033	580.950
A2	641.200	665.400
B2 A1	941.633	973.783
A2	661.533	633.667
C2 B1 A1	867.267	566.067
A2	730.650	491.700
B2 A1	994.483	717.217
A2	501.467	797.500
C3 B1 A1	688.433	834.033
A2	644.233	573.967
B2 A1	789.483	687.400
A2	659.783	906.033

TABLE 28. ANALYSIS OF VARIANCE - TOTAL TIME IN WHITE

BETWEEN SUBJECTS	80664236.000	359.		
CONSTANCY	768464.000	1.	768464.000	3.442
WAVEFORM	216880.000	1.	216880.000	0.971
INTENSITY	204700.000	2.	102350.000	0.458
FREQUENCY	550084.000	4.	137521.000	0.616
CONSTANCY x WAVEFORM	47132.000	1.	47132.000	0.211
CONSTANCY x INTENSITY	89500.000	2.	44750.000	0.200
CONSTANCY x FREQUENCY	605432.000	4.	151408.000	0.678
WAVEFORM x INTENSITY	241340.000	2.	120670.000	0.540
WAVEFORM x FREQUENCY	3363548.000	4.	840887.000	3.766
INTENSITY x FREQUENCY	1527100.000	8.	190887.500	0.855
CONSTANCY x WAVEFORM x INTENSITY	206708.000	2.	103354.000	0.463
CONSTANCY x WAVEFORM x FREQUENCY	1070964.000	4.	267741.000	1.199
CONSTANCY x INTENSITY x FREQUENCY	2214304.000	8.	276788.000	1.240
WAVEFORM x INTENSITY x FREQUENCY	1060048.000	8.	132506.000	0.593
CONSTANCY x WAVEFORM x INTENSITY x FREQUENCY	1316712.000	8.	164589.000	0.737
ERROR TERM	66981116.000	300.	223270.385	
WITHIN SUBJECTS	35857400.000	360.		
TIME	128804.000	1.	128804.000	1.298
CONSTANCY x TIME	89500.000	1.	89500.000	0.902
TIME x WAVEFORM	1540.000	1.	1540.000	0.016
TIME x INTENSITY	343720.000	2.	171860.000	1.732
TIME x FREQUENCY	433712.000	4.	108428.000	1.093
CONSTANCY x TIME x WAVEFORM	111996.000	1.	111996.000	1.129
CONSTANCY x TIME x INTENSITY	582224.000	2.	291112.000	2.935
CONSTANCY x TIME x FREQUENCY	723144.000	4.	180786.000	1.822
TIME x WAVEFORM x INTENSITY	10016.000	2.	5008.000	0.050
TIME x WAVEFORM x FREQUENCY	113952.000	4.	28488.000	0.287
TIME x INTENSITY x FREQUENCY	425852.000	8.	53231.500	0.537
CONSTANCY x TIME x WAVEFORM x INTENSITY	74216.000	2.	37108.000	0.374
CONSTANCY x TIME x WAVEFORM x FREQUENCY	261352.000	4.	65338.000	0.659
CONSTANCY x TIME x INTENSITY x FREQUENCY	1483612.000	8.	185451.500	1.869
TIME x WAVEFORM x INTENSITY x FREQUENCY	874632.000	8.	109329.000	1.102
CONSTANCY x TIME x WAVEFORM x INTENSITY x FREQUENCY	439400.000	8.	54925.000	0.554
ERROR TERM	29759748.000	300.	99199.159	

TABLE 29. MEANS - TOTAL-FREEZING

				E1	E2
D1	C1	B1	A1	411.083	363.300
			A2	227.550	370.583
		B2	A1	620.433	719.883
			A2	504.767	388.683
	C2	B1	A1	704.583	509.033
			A2	544.150	567.800
		B2	A1	590.717	556.467
			A2	474.700	466.783
	C3	B1	A1	527.483	591.467
			A2	446.833	404.467
		B2	A1	609.883	649.883
			A2	659.417	417.000
D2	C1	B1	A1	565.167	466.200
			A2	374.150	474.200
		B2	A1	717.217	580.350
			A2	475.583	256.100
	C2	B1	A1	401.917	747.567
			A2	339.417	394.083
		B2	A1	878.633	767.350
			A2	649.867	399.733
	C3	B1	A1	748.300	670.583
			A2	593.767	511.783
		B2	A1	890.667	503.467
			A2	619.583	575.450
D3	C1	B1	A1	725.533	581.183
			A2	327.533	348.950
		B2	A1	660.867	749.383
			A2	504.650	372.217
	C2	B1	A1	747.967	645.583
			A2	777.350	364.100
		B2	A1	530.700	494.483
			A2	734.233	634.100
	C3	B1	A1	764.583	545.000
			A2	620.050	556.267
		B2	A1	847.150	374.233
			A2	702.517	850.367
D4	C1	B1	A1	847.583	711.850
			A2	314.883	410.067
		B2	A1	687.900	465.033
			A2	445.883	369.217
	C2	B1	A1	723.517	455.000
			A2	322.100	478.150
		B2	A1	504.017	436.133
			A2	571.033	451.300
	C3	B1	A1	961.250	622.870
			A2	759.200	547.233
		B2	A1	816.067	450.650
			A2	587.250	475.583
D5	C1	B1	A1	562.000	318.183
			A2	580.883	456.167
		B2	A1	529.667	594.583
			A2	606.700	343.567
	C2	B1	A1	633.633	807.200
			A2	554.167	600.367
		B2	A1	710.700	517.367
			A2	844.783	419.050
	C3	B1	A1	737.483	664.783
			A2	416.600	534.550
		B2	A1	848.400	596.383
			A2	737.550	587.617

TABLE 30. ANALYSIS OF VARIANCE - TOTAL-FREEZING

BETWEEN SUBJECTS	37924997.000	359.		
CONSTANCY	3289630.000	1.	3289630.000	38.019
WAVEFORM	105222.000	1.	105222.000	1.216
INTENSITY	1210428.000	2.	605214.000	6.995
FREQUENCY	326332.000	4.	81583.000	0.943
CONSTANCY x WAVEFORM	267328.000	1.	267328.000	3.090
CONSTANCY x INTENSITY	451962.000	2.	225981.000	2.612
CONSTANCY x FREQUENCY	506550.000	4.	126637.500	1.464
WAVEFORM x INTENSITY	213504.000	2.	106752.000	1.234
WAVEFORM x FREQUENCY	689916.000	4.	172479.000	1.993
INTENSITY x FREQUENCY	623560.000	8.	77945.000	0.901
CONSTANCY x WAVEFORM x INTENSITY	421772.000	2.	210886.000	2.437
CONSTANCY x WAVEFORM x FREQUENCY	762672.000	4.	190668.000	2.204
CONSTANCY x INTENSITY x FREQUENCY	1431046.000	8.	178880.750	2.067
WAVEFORM x INTENSITY x FREQUENCY	959647.000	8.	119955.250	1.386
CONSTANCY x WAVEFORM x INTENSITY x FREQUENCY	707750.000	8.	88468.750	1.022
ERROR TERM	25957680.000	300.	86525.600	
WITHIN SUBJECTS	11864456.000	360.		
TIME	1473804.000	1.	1473804.000	55.598
CONSTANCY x TIME	170132.000	1.	170132.000	6.418
TIME x WAVEFORM	339722.000	1.	339722.000	12.816
TIME x INTENSITY	57242.000	2.	28621.000	1.080
TIME x FREQUENCY	66852.000	4.	16713.000	0.630
CONSTANCY x TIME x WAVEFORM	478116.000	1.	478116.000	18.037
CONSTANCY x TIME x INTENSITY	8130.000	2.	4065.000	0.153
CONSTANCY x TIME x FREQUENCY	223298.000	4.	55824.500	2.106
TIME x WAVEFORM x INTENSITY	1614.000	2.	807.000	0.030
TIME x WAVEFORM x FREQUENCY	43802.000	4.	10950.500	0.413
TIME x INTENSITY x FREQUENCY	243780.000	8.	30472.500	1.150
CONSTANCY x TIME x WAVEFORM x INTENSITY	185838.000	2.	92919.000	3.505
CONSTANCY x TIME x WAVEFORM x FREQUENCY	15390.000	4.	3847.500	0.145
CONSTANCY x TIME x INTENSITY x FREQUENCY	161816.000	8.	20227.000	0.763
TIME x WAVEFORM x INTENSITY x FREQUENCY	339722.000	8.	42465.250	1.602
CONSTANCY x TIME x WAVEFORM x INTENSITY x FREQUENCY	102750.000	8.	12843.750	0.485
ERROR TERM	7952456.000	300.	26508.187	

TABLE 31. MEANS - CROSSES TO BLACK

				E1	E2
D1	C1	B1	A1	8.833	7.167
			A2	12.167	9.000
		B2	A1	2.667	4.500
			A2	11.167	8.333
	C2	B1	A1	7.167	4.167
			A2	7.500	6.500
		B2	A1	6.167	7.000
			A2	4.500	11.000
	C3	B1	A1	4.167	7.000
			A2	6.333	7.333
		B2	A1	2.667	5.667
			A2	8.333	16.500
D2	C1	B1	A1	5.333	7.167
			A2	12.667	7.667
		B2	A1	2.500	3.667
			A2	11.000	13.500
	C2	B1	A1	1.167	1.500
			A2	10.333	13.000
		B2	A1	5.500	3.833
			A2	6.333	9.833
	C3	B1	A1	3.833	4.333
			A2	9.000	8.667
		B2	A1	4.333	4.000
			A2	8.000	7.833
D3	C1	B1	A1	4.667	9.333
			A2	12.500	13.500
		B2	A1	1.667	2.333
			A2	10.667	13.333
	C2	B1	A1	2.167	2.833
			A2	17.000	13.833
		B2	A1	6.833	7.000
			A2	3.000	3.667
	C3	B1	A1	1.667	4.500
			A2	6.000	11.333
		B2	A1	7.833	11.000
			A2	5.333	3.833
D4	C1	B1	A1	2.333	6.667
			A2	10.667	12.000
		B2	A1	4.500	8.000
			A2	11.000	4.667
	C2	B1	A1	3.000	9.333
			A2	11.500	9.333
		B2	A1	8.167	8.000
			A2	7.000	6.667
	C3	B1	A1	1.833	4.167
			A2	2.167	4.167
		B2	A1	4.833	3.167
			A2	8.000	4.167
D5	C1	B1	A1	7.833	10.167
			A2	5.333	8.500
		B2	A1	6.500	6.833
			A2	8.500	13.000
	C2	B1	A1	5.667	3.833
			A2	10.333	7.000
		B2	A1	4.667	5.333
			A2	5.333	7.500
	C3	B1	A1	4.833	5.167
			A2	5.500	5.667
		B2	A1	4.667	4.000
			A2	2.833	5.833

TABLE 32. ANALYSIS OF VARIANCE - CROSSES TO BLACK

BETWEEN SUBJECTS	23316.266	359.		
CONSTANCY	2475.313	1.	2475.313	45.882
WAVEFORM	17.735	1.	17.735	0.329
INTENSITY	561.345	2.	280.672	5.202
FREQUENCY	133.064	4.	33.266	0.617
CONSTANCY X WAVEFORM	129.201	1.	129.201	2.395
CONSTANCY X INTENSITY	282.033	2.	141.017	2.614
CONSTANCY X FREQUENCY	310.736	4.	77.684	1.440
WAVEFORM X INTENSITY	41.078	2.	20.539	0.381
WAVEFORM X FREQUENCY	158.147	4.	39.537	0.733
INTENSITY X FREQUENCY	240.586	8.	30.073	0.557
CONSTANCY X WAVEFORM X INTENSITY	604.745	2.	302.372	5.605
CONSTANCY X WAVEFORM X FREQUENCY	694.542	4.	173.635	3.218
CONSTANCY X INTENSITY X FREQUENCY	453.647	8.	56.706	1.051
WAVEFORM X INTENSITY X FREQUENCY	394.270	8.	49.284	0.914
CONSTANCY X WAVEFORM X INTENSITY X FREQUENCY	634.908	8.	79.364	1.471
ERROR TERM	16184.917	300.	53.950	
WITHIN SUBJECTS	6218.500	360.		
TIME	87.501	1.	87.501	5.439
CONSTANCY X TIME	1.513	1.	1.513	0.094
TIME X WAVEFORM	11.501	1.	11.501	0.715
TIME X INTENSITY	52.811	2.	26.406	1.641
TIME X FREQUENCY	14.520	4.	3.630	0.226
CONSTANCY X TIME X WAVEFORM	61.835	1.	61.835	3.844
CONSTANCY X TIME X INTENSITY	15.833	2.	7.917	0.492
CONSTANCY X TIME X FREQUENCY	45.258	4.	11.314	0.703
TIME X WAVEFORM X INTENSITY	17.911	2.	8.956	0.557
TIME X WAVEFORM X FREQUENCY	175.214	4.	43.804	2.72
TIME X INTENSITY X FREQUENCY	306.230	8.	38.279	2.37
CONSTANCY X TIME X WAVEFORM X INTENSITY	24.579	2.	12.290	0.76
CONSTANCY X TIME X WAVEFORM X FREQUENCY	53.520	4.	13.380	0.83
CONSTANCY X TIME X INTENSITY X FREQUENCY	149.459	8.	18.682	1.16
TIME X WAVEFORM X INTENSITY X FREQUENCY	142.436	8.	17.804	1.10
CONSTANCY X TIME X WAVEFORM X INTENSITY X FREQUENCY	232.128	8.	29.016	1.80
ERROR TERM	4826.250	300.	16.087	

D1 C1 B1 A1	9.500	7.500
A2	12.667	9.333
B2 A1	3.333	6.833
A2	11.500	9.167
C2 B1 A1	7.667	6.667
A2	7.833	7.000
B2 A1	8.500	7.500
A2	9.333	11.667
C3 B1 A1	9.667	7.667
A2	7.167	7.833
B2 A1	5.167	6.500
A2	9.000	12.167
D2 C1 B1 A1	6.000	7.667
A2	12.833	8.000
B2 A1	5.000	9.500
A2	11.000	14.000
C2 B1 A1	1.833	2.000
A2	11.000	13.833
B2 A1	6.167	9.500
A2	7.000	10.500
C3 B1 A1	9.667	5.333
A2	9.333	8.833
B2 A1	5.333	9.500
A2	6.833	8.333
D3 C1 B1 A1	5.000	9.667
A2	11.000	14.000
B2 A1	2.000	3.000
A2	11.167	13.833
C2 B1 A1	2.833	3.667
A2	17.667	14.500
B2 A1	5.333	7.500
A2	3.667	4.333
C3 B1 A1	2.833	5.333
A2	6.667	12.000
B2 A1	6.167	11.333
A2	5.667	4.333
D4 C1 B1 A1	2.667	1.500
A2	11.333	12.333
B2 A1	5.333	8.833
A2	11.500	10.167
C2 B1 A1	3.667	10.000
A2	12.333	5.833
B2 A1	8.667	9.333
A2	7.667	7.333
C3 B1 A1	2.333	4.333
A2	5.167	7.000
B2 A1	5.167	5.833
A2	8.500	4.667
D5 C1 B1 A1	6.500	10.500
A2	5.667	9.000
B2 A1	7.500	7.500
A2	9.333	13.500
C2 B1 A1	6.500	9.500
A2	11.000	7.333
B2 A1	5.500	6.167
A2	5.500	8.167
C3 B1 A1	5.667	6.000
A2	9.833	6.000
B2 A1	5.333	4.667
A2	3.667	6.500

TABLE 34. ANALYSIS OF VARIANCE - CROSSES TO WHITE

BETWEEN SUBJECTS	23136.900	359.		
CONSTANCY	2390.755	1.	2390.755	44.244
WAVEFORM	16.200	1.	16.200	0.300
INTENSITY	512.633	2.	256.317	4.743
FREQUENCY	121.689	4.	30.422	0.563
CONSTANCY x WAVEFORM	118.422	1.	118.422	2.192
CONSTANCY x INTENSITY	269.412	2.	134.706	2.493
CONSTANCY x FREQUENCY	312.439	4.	78.110	1.446
WAVEFORM x INTENSITY	32.433	2.	16.217	0.300
WAVEFORM x FREQUENCY	174.244	4.	43.561	0.806
INTENSITY x FREQUENCY	251.145	8.	31.393	0.581
CONSTANCY x WAVEFORM x INTENSITY	579.811	2.	289.905	5.365
CONSTANCY x WAVEFORM x FREQUENCY	704.217	4.	176.054	3.258
CONSTANCY x INTENSITY x FREQUENCY	457.311	8.	57.164	1.058
WAVEFORM x INTENSITY x FREQUENCY	388.706	8.	48.588	0.899
CONSTANCY x WAVEFORM x INTENSITY x FREQUENCY	596.717	8.	74.590	1.380
ERROR TERM	16210.667	300.	54.036	
WITHIN SUBJECTS	6106.200	360.		
TIME	82.689	1.	82.689	5.253
CONSTANCY x TIME	1.422	1.	1.422	0.090
TIME x WAVEFORM	16.200	1.	16.200	1.029
TIME x INTENSITY	49.478	2.	24.739	1.572
TIME x FREQUENCY	17.200	4.	4.300	0.273
CONSTANCY x TIME x WAVEFORM	64.800	1.	64.800	4.116
CONSTANCY x TIME x INTENSITY	13.377	2.	6.689	0.425
CONSTANCY x TIME x FREQUENCY	54.939	4.	13.735	0.872
TIME x WAVEFORM x INTENSITY	18.434	2.	9.217	0.585
TIME x WAVEFORM x FREQUENCY	173.189	4.	43.297	2.750
TIME x INTENSITY x FREQUENCY	304.300	8.	38.038	2.416
CONSTANCY x TIME x WAVEFORM x INTENSITY	25.601	2.	12.800	0.813
CONSTANCY x TIME x WAVEFORM x FREQUENCY	49.506	4.	12.376	0.786
CONSTANCY x TIME x INTENSITY x FREQUENCY	137.512	8.	17.189	1.092
TIME x WAVEFORM x INTENSITY x FREQUENCY	145.594	8.	18.199	1.156
CONSTANCY x TIME x WAVEFORM x INTENSITY x FREQUENCY	229.096	8.	28.637	1.819
ERROR TERM	4722.667	300.	15.742	

	E1	E2
D1 C1 B1 A1	16.333	14.667
A2	24.833	18.333
B2 A1	6.000	9.333
A2	22.667	17.500
C2 B1 A1	14.833	8.833
A2	15.333	13.500
B2 A1	16.667	14.500
A2	17.833	22.667
C3 B1 A1	8.833	14.667
A2	13.500	15.167
B2 A1	9.833	12.167
A2	17.333	11.667
D2 C1 B1 A1	11.333	14.833
A2	25.500	15.667
B2 A1	5.500	8.167
A2	22.000	27.500
C2 B1 A1	3.000	3.500
A2	21.333	20.833
B2 A1	11.667	8.333
A2	13.333	20.333
C3 B1 A1	8.500	9.667
A2	14.333	17.500
B2 A1	9.667	8.500
A2	15.833	16.167
D3 C1 B1 A1	9.667	19.000
A2	25.500	27.500
B2 A1	3.667	5.333
A2	21.833	27.167
C2 B1 A1	5.000	6.500
A2	34.667	28.333
B2 A1	18.167	14.500
A2	6.667	8.000
C3 B1 A1	4.500	9.833
A2	12.667	23.333
B2 A1	16.000	22.333
A2	11.333	4.167
D4 C1 B1 A1	5.000	7.167
A2	22.000	24.333
B2 A1	5.833	16.833
A2	27.500	19.833
C2 B1 A1	6.667	19.333
A2	23.833	19.167
B2 A1	16.833	15.333
A2	14.667	16.000
C3 B1 A1	4.167	8.500
A2	5.333	11.167
B2 A1	10.000	7.000
A2	16.500	8.833
D5 C1 B1 A1	16.333	20.667
A2	11.000	17.500
B2 A1	14.000	16.333
A2	17.833	26.500
C2 B1 A1	12.167	8.333
A2	21.333	14.333
B2 A1	10.167	11.500
A2	10.833	15.667
C3 B1 A1	10.500	11.167
A2	19.333	11.667
B2 A1	10.000	6.667
A2	6.500	12.333

TABLE 36. ANALYSIS OF VARIANCE - TOTAL CROSSES

BETWEEN SUBJECTS	42792.779	359.		
CONSTANCY	9731.400	1.	9731.400	45.123
WAVEFORM	67.834	1.	67.834	0.315
INTENSITY	2146.477	2.	1073.238	4.976
FREQUENCY	509.111	4.	127.278	0.590
CONSTANCY x WAVEFORM	495.014	1.	495.014	2.295
CONSTANCY x INTENSITY	1102.346	2.	551.173	2.556
CONSTANCY x FREQUENCY	1243.244	4.	310.811	1.441
WAVEFORM x INTENSITY	145.479	2.	72.939	0.338
WAVEFORM x FREQUENCY	662.699	4.	165.675	0.768
INTENSITY x FREQUENCY	981.773	8.	122.722	0.569
CONSTANCY x WAVEFORM x INTENSITY	2368.531	2.	1184.266	5.491
CONSTANCY x WAVEFORM x FREQUENCY	2796.689	4.	699.172	3.242
CONSTANCY x INTENSITY x FREQUENCY	1818.574	8.	227.322	1.054
WAVEFORM x INTENSITY x FREQUENCY	1564.152	8.	195.519	0.907
CONSTANCY x WAVEFORM x INTENSITY x FREQUENCY	2459.828	8.	307.479	1.426
ERROR TERM	64699.250	300.	215.664	
WITHIN SUBJECTS	24575.500	360.		
TIME	340.313	1.	340.313	5.363
CONSTANCY x TIME	5.869	1.	5.869	0.093
TIME x WAVEFORM	55.002	1.	55.002	0.867
TIME x INTENSITY	204.434	2.	102.217	1.611
TIME x FREQUENCY	63.166	4.	15.792	0.249
CONSTANCY x TIME x WAVEFORM	253.234	1.	253.234	3.991
CONSTANCY x TIME x INTENSITY	58.213	2.	29.106	0.459
CONSTANCY x TIME x FREQUENCY	199.836	4.	49.959	0.787
TIME x WAVEFORM x INTENSITY	72.678	2.	36.339	0.573
TIME x WAVEFORM x FREQUENCY	696.645	4.	174.161	2.745
TIME x INTENSITY x FREQUENCY	1219.487	8.	152.435	2.402
CONSTANCY x TIME x WAVEFORM x INTENSITY	100.314	2.	50.157	0.791
CONSTANCY x TIME x WAVEFORM x FREQUENCY	205.859	4.	51.465	0.811
CONSTANCY x TIME x INTENSITY x FREQUENCY	571.982	8.	71.498	1.127
TIME x WAVEFORM x INTENSITY x FREQUENCY	573.238	8.	71.655	1.129
CONSTANCY x TIME x WAVEFORM x INTENSITY x FREQUENCY	920.324	8.	115.041	1.813
ERROR TERM	19034.918	300.	63.450	

TABLE 37. MEANS - PERCENTAGE-FREEZING IN BLACK

	E1	E2
D1 C1 B1 A1	36.050	35.000
A2	17.483	27.017
B2 A1	44.033	45.133
A2	36.183	16.033
C2 B1 A1	32.900	26.683
A2	45.817	23.533
B2 A1	51.433	54.950
A2	49.017	21.683
C3 B1 A1	39.417	20.733
A2	22.000	31.033
B2 A1	55.083	50.900
A2	35.867	33.283
D2 C1 B1 A1	40.800	40.400
A2	33.933	42.250
B2 A1	31.783	33.733
A2	25.467	15.683
C2 B1 A1	60.283	53.550
A2	27.600	22.567
B2 A1	64.767	57.667
A2	33.267	22.583
C3 B1 A1	43.100	12.833
A2	47.800	48.433
B2 A1	25.517	14.467
A2	26.650	23.400
D3 C1 B1 A1	64.083	48.983
A2	24.517	24.450
B2 A1	62.417	61.400
A2	54.417	33.367
C2 B1 A1	35.417	32.750
A2	15.083	29.350
B2 A1	10.450	25.133
A2	57.483	25.767
C3 B1 A1	40.933	21.683
A2	36.717	37.767
B2 A1	47.000	21.950
A2	47.367	42.583
D4 C1 B1 A1	59.867	20.167
A2	13.183	28.417
B2 A1	50.933	24.867
A2	36.483	29.033
C2 B1 A1	42.700	30.283
A2	27.333	31.850
B2 A1	37.700	29.350
A2	47.750	23.133
C3 B1 A1	52.933	61.783
A2	35.633	45.933
B2 A1	34.583	32.367
A2	35.400	26.317
D5 C1 B1 A1	34.183	27.117
A2	39.100	33.133
B2 A1	17.350	18.667
A2	56.867	28.533
C2 B1 A1	66.550	43.867
A2	26.350	37.067
B2 A1	31.317	36.417
A2	44.167	14.533
C3 B1 A1	41.167	27.200
A2	25.150	36.933
B2 A1	37.417	34.450
A2	35.600	49.533

TABLE 38. ANALYSIS OF VARIANCE - PERCENTAGE-FREEZING IN BLACK

BETWEEN SUBJECTS	372965.445	359.		
CONSTANCY	7752.508	1.	7752.508	7.923
WAVEFORM	282.453	1.	282.453	0.289
INTENSITY	257.508	2.	128.754	0.132
FREQUENCY	1175.898	4.	293.975	0.300
CONSTANCY X WAVEFORM	886.492	1.	886.492	0.906
CONSTANCY X INTENSITY	3477.766	2.	1738.883	1.777
CONSTANCY X FREQUENCY	3627.969	4.	906.992	0.927
WAVEFORM X INTENSITY	424.219	2.	212.109	0.217
WAVEFORM X FREQUENCY	9162.984	4.	2290.746	2.341
INTENSITY X FREQUENCY	12995.164	8.	1624.396	1.660
CONSTANCY X WAVEFORM X INTENSITY	600.406	2.	300.203	0.307
CONSTANCY X WAVEFORM X FREQUENCY	7639.484	4.	1909.871	1.952
CONSTANCY X INTENSITY X FREQUENCY	22249.086	8.	2781.136	2.842
WAVEFORM X INTENSITY X FREQUENCY	7242.484	8.	905.311	0.925
CONSTANCY X WAVEFORM X INTENSITY X FREQUENCY	1645.453	8.	205.682	0.210
ERROR TERM	293545.578	300.	978.485	
WITHIN SUBJECTS	223707.047	360.		
TIME	9944.047	1.	9944.047	16.387
CONSTANCY X TIME	685.313	1.	685.313	1.129
TIME X WAVEFORM	1734.297	1.	1734.297	2.858
TIME X INTENSITY	693.469	2.	346.734	0.571
TIME X FREQUENCY	351.820	4.	87.955	0.145
CONSTANCY X TIME X WAVEFORM	8267.211	1.	8267.211	13.624
CONSTANCY X TIME X INTENSITY	3213.344	2.	1606.672	2.648
CONSTANCY X TIME X FREQUENCY	1637.984	4.	409.496	0.675
TIME X WAVEFORM X INTENSITY	706.430	2.	353.215	0.582
TIME X WAVEFORM X FREQUENCY	716.508	4.	179.127	0.295
TIME X INTENSITY X FREQUENCY	3837.688	8.	479.711	0.791
CONSTANCY X TIME X WAVEFORM X INTENSITY	834.586	2.	417.293	0.688
CONSTANCY X TIME X WAVEFORM X FREQUENCY	489.539	4.	122.385	0.202
CONSTANCY X TIME X INTENSITY X FREQUENCY	5408.797	8.	676.100	1.114
TIME X WAVEFORM X INTENSITY X FREQUENCY	1898.563	8.	237.320	0.391
CONSTANCY X TIME X WAVEFORM X INTENSITY X FREQUENCY	1242.469	8.	155.309	0.256
ERROR TERM	182045.016	300.	606.817	

TABLE 39. MEANS - PERCENTAGE-FREEZING IN WHITE

	E1	E2
D1 C1 B1 A1	26.967	34.550
A2	14.200	22.200
B2 A1	45.133	32.533
A2	27.100	35.083
C2 B1 A1	54.983	42.850
A2	8.417	28.950
B2 A1	35.600	21.867
A2	24.117	31.867
C3 B1 A1	31.083	48.883
A2	35.300	20.167
B2 A1	40.133	54.117
A2	41.617	24.783
D2 C1 B1 A1	31.783	26.867
A2	13.600	28.300
B2 A1	47.900	37.783
A2	33.417	21.467
C2 B1 A1	40.017	31.367
A2	26.600	27.317
B2 A1	34.000	50.567
A2	47.700	24.583
C3 B1 A1	44.867	57.233
A2	23.650	15.950
B2 A1	55.550	42.350
A2	53.167	46.467
D3 C1 B1 A1	28.917	31.750
A2	24.633	35.083
B2 A1	21.333	34.483
A2	31.200	18.250
C2 B1 A1	57.450	42.033
A2	25.483	28.033
B2 A1	28.383	48.350
A2	41.983	39.600
C3 B1 A1	66.183	52.000
A2	28.083	24.983
B2 A1	33.900	27.250
A2	33.017	39.433
D4 C1 B1 A1	50.133	51.450
A2	24.067	24.383
B2 A1	44.367	39.100
A2	16.950	17.450
C2 B1 A1	33.683	40.617
A2	24.800	30.250
B2 A1	45.000	27.617
A2	31.267	33.600
C3 B1 A1	40.400	10.683
A2	49.067	36.500
B2 A1	37.133	33.550
A2	38.600	36.383
D5 C1 B1 A1	34.467	19.450
A2	37.967	40.683
B2 A1	44.617	54.017
A2	38.683	14.717
C2 B1 A1	47.233	36.650
A2	44.050	34.650
B2 A1	55.433	31.333
A2	26.300	32.617
C3 B1 A1	37.383	57.933
A2	25.050	24.417
B2 A1	37.467	33.233
A2	32.717	24.700

TABLE 40. ANALYSIS OF VARIANCE - PERCENTAGE-FREEZING IN WHITE

BETWEEN SUBJECTS	274429.656	359.		
CONSTANCY	15054.656	1.	15054.656	21.009
WAVEFORM	127.203	1.	127.203	0.177
INTENSITY	3609.453	2.	1804.727	2.518
FREQUENCY	1490.883	4.	372.721	0.520
CONSTANCY X WAVEFORM	1872.500	1.	1872.500	2.613
CONSTANCY X INTENSITY	216.633	2.	108.316	0.151
CONSTANCY X FREQUENCY	809.742	4.	202.436	0.282
WAVEFORM X INTENSITY	258.883	2.	129.441	0.181
WAVEFORM X FREQUENCY	3770.836	4.	942.709	1.315
INTENSITY X FREQUENCY	3703.742	8.	462.968	0.646
CONSTANCY X WAVEFORM X INTENSITY	4188.172	2.	2094.086	2.922
CONSTANCY X WAVEFORM X FREQUENCY	6062.070	4.	1515.518	2.115
CONSTANCY X INTENSITY X FREQUENCY	8993.867	8.	1124.233	1.569
WAVEFORM X INTENSITY X FREQUENCY	2916.742	8.	364.593	0.509
CONSTANCY X WAVEFORM X INTENSITY X FREQUENCY	6339.930	8.	792.491	1.106
ERROR TERM	215014.344	300.	716.714	
WITHIN SUBJECTS	145710.125	360.		
TIME	1653.000	1.	1653.000	4.078
CONSTANCY X TIME	179.703	1.	179.703	0.443
TIME X WAVEFORM	1107.680	1.	1107.680	2.733
TIME X INTENSITY	451.078	2.	225.539	0.556
TIME X FREQUENCY	579.805	4.	144.951	0.358
CONSTANCY X TIME X WAVEFORM	183.016	1.	183.016	0.452
CONSTANCY X TIME X INTENSITY	1109.984	2.	554.992	1.369
CONSTANCY X TIME X FREQUENCY	482.961	4.	120.740	0.298
TIME X WAVEFORM X INTENSITY	184.516	2.	92.258	0.228
TIME X WAVEFORM X FREQUENCY	1028.430	4.	257.107	0.634
TIME X INTENSITY X FREQUENCY	2235.180	8.	279.397	0.689
CONSTANCY X TIME X WAVEFORM X INTENSITY	928.625	2.	464.313	1.146
CONSTANCY X TIME X WAVEFORM X FREQUENCY	1153.977	4.	288.494	0.712
CONSTANCY X TIME X INTENSITY X FREQUENCY	5336.102	8.	667.013	1.646
TIME X WAVEFORM X INTENSITY X FREQUENCY	2894.336	8.	361.792	0.893
CONSTANCY X TIME X WAVEFORM X INTENSITY X FREQUENCY	4609.508	8.	576.188	1.422
ERROR TERM	121592.109	300.	405.307	

APPENDIX L

Summaries of the means and of the analyses of variance of the inter-retention test measures (collapsed over frequency).

Parameter identification key:

Intensity

A1 - 5db
A2 - 10 db
A3 - 15 db

Time

B1 - Retention Test 1
BN - Retention Test 2

Waveform

C1 - Sine wave
C2 - Square wave

Constancy

D1 - Constant current
D2 - Constant voltage

Values in E format - $\Sigma x^2/N$

(B1 - - - - - BN)	
270.730	244.003
0.114E 06	C.128E 06
157.157	210.207
0.574E 05	0.899E 05
169.687	243.117
0.612E 05	0.110E 06
C--------	
190.093	19C.417
0.713E 05	0.628E 05
219.323	276.050
0.776E 05	0.114E 06
183.267	248.527
0.730E 05	0.108E 06
C--------	
D----------	
426.543	411.103
0.227E 06	0.197E 06
403.217	295.530
0.210E 06	C.120E 06
256.023	296.963
0.118E 06	0.124E 06
C--------	
287.473	374.483
0.114E 06	0.182E 06
237.123	274.540
0.906E 05	0.114E 06
213.043	353.023
0.888E 05	0.207E 06
C--------	
D----------	

	SS	DF	MS	F
AT S*S	24572397.0000	359.		
A- INTEN	460047.5000	2.	230023.7500	3.753
C-NV-FRM	183390.0000	1.	183390.0000	2.992
D- CONST	1777806.0000	1.	1777806.0000	29.006
AC	295475.0000	2.	147737.5000	2.410
AD	168226.0000	2.	84113.0000	1.372
CD	125014.0000	1.	125014.0000	2.040
ACD	233301.5000	2.	116650.7500	1.903
S*S W	21329137.5000	348.	61290.6250	
W S*S	8876872.0000	360.		
B- TIME	240306.0000	1.	240306.0000	10.431
AB	174179.5000	2.	87089.7500	3.780
BC	130419.0000	1.	130419.0000	5.661
BD	6663.0000	1.	6663.0000	0.289
ABC	7073.5000	2.	3536.7500	0.154
ABD	126171.5000	2.	63085.7500	2.738
BCD	171341.0000	1.	171341.0000	7.437
ABCD	3249.0000	2.	1624.5000	0.071
BXS*S	8017469.5000	348.	23038.7053	
TOTAL	33449269.0000	719.		

TABLE 3. MEANS - FREEZING IN BLACK

(B1 - - - - - BN)	
372.183	208.167
0.255E 06	0.105E 06
337.757	236.480
0.255E 06	C.140E 06
337.567	203.387
0.232E 06	0.109E 06
C--------	
291.530	250.333
0.187E 06	0.197E 06
299.793	277.560
0.184E 06	0.165E 06
321.373	2C5.707
0.235E 06	C.115E 06
C--------	
D----------	
195.893	234.560
0.835E 05	0.886E 05
206.717	225.430
0.103E 06	0.126E 06
265.790	336.4C7
0.190E 06	0.228E 06
C--------	
295.380	178.430
0.159E 06	0.772E 05
348.033	154.057
0.231E 06	C.867E 05
279.307	247.563
0.198E 06	0.124E 06
C --------	
D----------	

TABLE 4. ANALYSIS OF VARIANCE - FREEZING IN BLACK

	SS	DF	MS	F
AT S*S	44435777.5000	359.		
A- INTEN	56396.5000	2.	28198.2500	0.224
C-NV-FRM	285.5000	1.	285.5000	0.002
D- CONST	175223.5000	1.	175223.5000	1.389
AC	49658.5000	2.	24829.2500	0.197
AD	194039.0000	2.	97019.5000	0.769
CD	9383.0000	1.	9383.0000	0.074
ACD	46643.5000	2.	23321.7500	0.185
S*S W	43904148.0000	348.	126161.3447	
W S*S	22055798.0000	360.		
B- TIME	786669.5000	1.	786669.5000	13.615
AB	16377.5000	2.	8188.7500	0.142
BC	78180.0000	1.	78180.0000	1.353
BD	165401.0000	1.	165401.0000	2.863
ABC	19195.5000	2.	9597.7500	0.166
ABD	217656.5000	2.	108828.2500	1.883
BCD	597051.5000	1.	597051.5000	10.333
ABCD	67619.5000	2.	33809.7500	0.585
BXS*S	20107647.0000	348.	57780.5947	
TOTAL	66491575.5000	719.		

TABLE 5. MEANS - MOVEMENT IN WHITE

(B1 - - - - - BN)	
308.197	427.853
0.153E 06	0.239E 06
299.520	385.917
0.149E 06	0.203E 06
295.493	309.410
0.144E 06	0.144E 06
C--------	
325.490	387.737
0.162E 06	0.206E 06
334.623	375.470
0.145E 06	0.208E 06
315.420	435.550
0.149E 06	0.244E 06
C--------	
D----------	
432.093	366.903
0.244E 06	0.166E 06
389.947	422.370
0.192E 06	0.230E 06
377.487	370.177
0.199E 06	0.204E 06
C--------	
392.610	479.560
0.205E 06	0.292E 06
337.953	462.427
0.166E 06	C.259E 06
327.613	315.833
0.154E 06	C.139E 06
C--------	
D----------	

TABLE 6. ANALYSIS OF VARIANCE - MOVEMENT IN WHITE

	SS	DF	MS	F
AT S*S	28568765.0000	359.		
A- INTEN	275640.0000	2.	137820.0000	1.735
C-NV-FRM	14006.0000	1.	14006.0000	0.176
D- CONST	281440.0000	1.	281440.0000	3.544
AC	2677.0000	2.	1338.5000	0.017
AD	84704.0000	2.	42352.0000	0.533
CD	45300.0000	1.	45300.0000	0.570
ACD	229184.0000	2.	114592.0000	1.443
S*S W	27635815.0000	348.	79413.2607	
W S*S	10899302.0000	360.		
B- TIME	454396.0000	1.	454396.0000	16.067
AB	53464.0000	2.	26732.0000	0.945
BC	73553.0000	1.	73553.0000	2.601
BD	100312.0000	1.	100312.0000	3.547
ABC	7024.0000	2.	3512.0000	0.124
ABD	87098.0000	2.	43549.0000	1.540
BCD	70136.0000	1.	70136.0000	2.480
ABCD	211470.0000	2.	105735.0000	3.739
BXS*S	9841848.0000	348.	28281.1724	
TOTAL	39468067.0000	719.		

TABLE 7. MEANS - FREEZING IN WHITE

(BI ------	BN)
248.890	279.977
0.134E 06	0.142E 06
405.567	367.397
0.288E 06	0.205E 06
397.253	415.880
0.281E 06	0.306E 06
C----------	
392.887	371.513
0.270E 06	0.225E 06
346.260	276.920
0.217E 06	0.159E 06
379.940	310.217
0.247E 06	0.159E 06
C----------	
D----------	
161.920	187.433
0.546E 05	0.582E 05
200.120	256.670
0.857E 05	0.122E 06
300.700	196.453
0.175E 06	0.765E 05
C----------	
224.537	167.527
0.925E 05	0.502E 05
276.890	308.937
0.148E 06	0.144E 06
380.037	283.560
0.251E 06	0.148E 06
C----------	
D----------	

TABLE 8. ANALYSIS OF VARIANCE - FREEZING IN WHITE

	SS	DF	MS	F
BT S*S	37796969.5000	359.		
A= INTEN	762867.5000	2.	381433.7500	3.911
C=MV-FRM	113413.5000	1.	113413.5000	1.163
D= CONST	1946732.0000	1.	1946732.0000	19.961
AC	185614.5000	2.	92807.2500	0.952
AD	103915.0000	2.	51957.5000	0.533
CD	176016.5000	1.	176016.5000	1.805
ACD	569098.0000	2.	284549.0000	2.918
S*S W	33939313.0000	348.	97526.7607	
W S*S	19636839.0000	360.		
B= TIME	107117.5000	1.	107117.5000	1.960
AB	133765.5000	2.	66882.7500	1.224
BC	91775.0000	1.	91775.0000	1.679
BD	-138.0000	1.	-138.0000	-0.003
ABC	12511.5000	2.	6255.7500	0.114
ABD	234657.0000	2.	117328.5000	2.147
BCD	6788.0000	1.	6788.0000	0.124
ABCD	31428.0000	2.	15714.0000	0.288
BXS*S	19018935.0000	348.	54652.1118	
TOTAL	57433808.5000	719.		

TABLE 9. MEANS - NO. MOVEMENTS IN BLACK

(BI ------	BN)
20.167	18.633
0.566E 03	0.454E 03
13.433	14.067
0.323E 03	0.320E 03
14.133	15.500
0.374E 03	0.379E 03
C----------	
12.267	13.267
0.220E 03	0.257E 03
15.667	15.867
0.360E 03	0.555E 03
14.233	16.100
0.341E 03	0.406E 03
C----------	
D----------	
22.267	26.833
0.591E 03	0.820E 03
22.767	22.600
0.617E 03	0.673E 03
16.633	22.667
0.444E 03	0.684E 03
C----------	
20.767	22.600
0.519E 03	0.604E 03
17.800	17.600
0.435E 03	0.431E 03
15.133	20.933
0.358E 03	0.577E 03
C----------	
D----------	

TABLE 10. ANALYSIS OF VARIANCE - NO. MOVEMENTS IN BLACK

	SS	DF	MS	F
BT S*S	72292.6621	359.		
A= INTEN	876.8770	2.	438.4385	2.403
C=MV-FRM	688.3555	1.	688.3555	3.772
D= CONST	4692.0059	1.	4692.0059	25.713
AC	703.4785	2.	351.7393	1.928
AD	344.6777	2.	172.3389	0.944
CD	259.1992	1.	259.1992	1.420
ACD	1226.6367	2.	613.3184	3.361
S*S W	63501.4336	348.	182.4754	
W S*S	30226.0000	360.		
B= TIME	806.4492	1.	806.4492	9.878
AB	248.7012	2.	124.3506	1.523
BC	16.2012	1.	16.2012	0.198
BD	133.4727	1.	133.4727	1.635
ABC	31.0332	2.	15.5166	0.190
ABD	425.5469	2.	212.7734	2.606
BCD	115.2012	1.	115.2012	1.411
ABCD	39.4395	2.	19.7197	0.242
BXS*S	28409.9668	348.	81.6378	
TOTAL	102518.6621	719.		

TABLE 11. MEANS - NO. FREEZING IN BLACK

(BI ------	BN)
13.567	10.867
0.325E 03	0.227E 03
8.767	8.867
0.185E 03	0.168E 03
9.967	9.700
0.235E 03	0.195E 03
C----------	
7.800	7.433
0.129E 03	0.124E 03
7.767	12.767
0.141E 03	0.324E 03
8.500	9.600
0.165E 03	0.210E 03
C----------	
D----------	
11.733	15.900
0.235E 03	0.382E 03
10.533	11.800
0.188E 03	0.272E 03
9.133	14.033
0.193E 03	0.350E 03
C----------	
9.467	10.067
0.140E 03	0.196E 03
10.933	9.033
0.199E 03	0.190E 03
8.167	12.333
0.134E 03	0.282E 03
C----------	
D----------	

TABLE 12. ANALYSIS OF VARIANCE - NO. FREEZING IN BLACK

	SS	DF	MS	F
BT S*S	53228.6611	359.		
A= INTEN	88.2861	2.	44.1431	0.299
C=MV-FRM	551.2500	1.	551.2500	3.730
D= CONST	384.2715	1.	384.2715	2.600
AC	639.3574	2.	319.6787	2.163
AD	21.2695	2.	10.6348	0.072
CD	34.6729	1.	34.6729	0.235
ACD	78.4209	2.	39.2104	0.265
S*S W	51431.1338	348.	147.7906	
W S*S	25068.0000	360.		
B= TIME	322.6719	1.	322.6719	4.759
AB	130.5195	2.	65.2598	0.962
BC	1.6055	1.	1.6055	0.024
BD	133.4727	1.	133.4727	1.968
ABC	16.8701	2.	8.4351	0.124
ABD	474.1025	2.	237.0513	3.496
BCD	322.6719	1.	322.6719	4.759
ABCD	68.4199	2.	34.2100	0.505
BXS*S	23597.6670	348.	67.8094	
TOTAL	78296.6611	719.		

TABLE 13. MEANS - NO. MOVEMENTS IN WHITE

(B1 - - - - - -	BN)
19.100	23.400
0.510E 03	0.684E 03
20.867	27.967
0.638E 03	0.106E 04
20.367	23.400
0.576E 03	0.719E 03
C---------	
18.933	23.933
0.517E 03	0.773E 03
21.767	22.400
0.585E 03	0.750E 03
20.300	25.333
0.543E 03	0.800E 03
C---------	
D-----------	
21.533	24.667
0.572E 03	0.743E 03
23.333	27.000
0.688E 03	0.881E 03
19.200	22.733
0.535E 03	0.743E 03
C---------	
23.700	25.000
0.710E 03	0.768E 03
20.100	29.133
0.555E C3	0.104E 04
20.533	24.733
0.624E 03	0.885E 03
C---------	
D-----------	

TABLE 14. ANALYSIS OF VARIANCE - NO. MOVEMENTS IN WHITE

	SS	DF	MS	F
BT S*S	87748.2695	359.		
A= INTEN	524.5898	2.	262.2949	1.057
C=MV-FRM	6.6133	1.	6.6133	0.027
D= CONST	241.5117	1.	241.5117	0.973
AC	250.3047	2.	125.1523	0.504
AD	279.1563	2.	139.5781	0.562
CD	64.2031	1.	64.2031	0.259
ACD	8.6445	2.	4.3223	0.017
S*S W	86373.2500	348.	248.1990	
W S*S	41854.5000	360.		
B= TIME	3120.8359	1.	3120.8359	28.677
AB	88.2852	2.	44.1426	0.406
BC	0.2344	1.	0.2344	0.002
BD	0.0703	1.	0.0703	0.001
ABC	35.7891	2.	17.8945	0.164
ABD	181.6719	2.	90.8359	0.835
BCD	79.3359	1.	79.3359	0.729
ABCD	476.4922	2.	238.2461	2.189
BXS*S	37871.7852	348.	108.8270	
TOTAL	129602.7695	719.		

TABLE 15. MEANS - NO. FREEZING IN WHITE

(B1 - - - - - -	BN)
12.900	16.167
0.293E 03	C.371E 03
16.633	23.200
0.424E 03	0.765E 03
16.700	18.067
0.431E 03	0.474E 03
C---------	
15.033	18.467
0.363E 03	0.491E 03
14.267	15.833
0.292E 03	0.471E 03
14.967	19.367
0.334E 03	0.541E 03
C---------	
D-----------	
11.133	14.333
0.224E 03	0.307E 03
11.467	16.600
0.214E 03	0.435E 03
12.233	14.567
0.269E 03	0.362E 03
C---------	
12.867	12.900
0.269E 03	0.251E C3
13.667	2C.90C
0.288E 03	0.615E 03
14.100	16.600
0.319E 03	0.467E 03
C---------	
D-----------	

TABLE 16. ANALYSIS OF VARIANCE - NO. FREEZING IN WHITE

	SS	DF	MS	F
BT S*S	68485.3320	359.		
A= INTEN	689.5352	2.	344.7676	1.837
C=MV-FRM	30.8340	1.	30.8340	0.164
D= CONST	1142.5664	1.	1142.5664	6.087
AC	137.4531	2.	68.7266	0.366
AD	43.5371	2.	21.7686	0.116
CD	337.5703	1.	337.5703	1.798
ACD	785.1191	2.	392.5596	2.091
S*S W	65318.7168	348.	187.6975	
W S*S	35695.5000	360.		
B= TIME	2104.6680	1.	2104.6680	22.298
AB	262.6367	2.	131.3184	1.391
BC	9.1133	1.	9.1133	0.097
BD	0.0352	1.	0.0352	0.000
ABC	94.5762	2.	47.2881	0.501
ABD	115.5039	2.	57.7520	0.612
BCD	1.0098	1.	1.0098	0.011
ABCD	260.5020	2.	130.2510	1.380
BXS*S	32847.4512	348.	94.3892	
TOTAL	1C4180.8320	719.		

TABLE 17. MEANS - TOTAL-FREEZING

(B1 - - - - - -	BN)
621.073	468.143
0.468E 06	0.295E 06
743.323	603.877
0.612E 06	0.41CF 06
734.820	619.267
0.606E 06	0.458E 06
C---------	
684.417	621.847
0.524E 06	C.470E 06
646.053	554.480
0.477E 06	0.374E 06
701.313	515.923
0.546E 06	0.318E 06
C---------	
D-----------	
357.800	421.993
0.169E 06	0.207E 06
406.837	482.100
0.224E 06	C.287E 06
566.490	532.860
0.403F 06	0.348F 06
C---------	
519.917	345.957
0.315E 06	0.152E 06
624.923	462.993
0.453E C6	0.254E 06
659.343	531.143
0.498E 06	0.331E 06
C---------	
D-----------	

TABLE 18. ANALYSIS OF VARIANCE - TOTAL-FREEZING

	SS	DF	MS	F
BT S*S	37925374.0000	359.		
A= INTEN	1210834.0000	2.	605417.0000	6.591
C=MV-FRM	105648.0000	1.	105648.0000	1.150
D= CONST	3290062.0000	1.	3290062.0000	35.818
AC	213052.0000	2.	106526.0000	1.160
AD	451504.0000	2.	225752.0000	2.458
CD	266860.0000	1.	266860.0000	2.905
ACD	422252.0000	2.	211126.0000	2.298
S*S W	31965164.0000	348.	91853.9189	
W S*S	11864456.0000	360.		
B= TIME	1474230.0000	1.	1474230.0000	54.070
AB	56790.0000	2.	28395.0000	1.080
BC	339260.0000	1.	339260.0000	12.903
BD	169664.0000	1.	169664.0000	6.453
ABC	2088.0000	2.	1044.0000	0.040
ABD	8610.0000	2.	4305.0000	0.164
BCD	478604.0000	1.	478604.0000	18.203
ABCD	185352.0000	2.	92676.0000	3.525
BXS*S	9149866.0000	348.	26292.7183	
TOTAL	49789830.0000	719.		

TABLE 19. MEANS - MEAN MOVEMENT IN BLACK

	(B1 - - - - -	- BN)
	12.167	13.170
	0.211E 03	0.237E 03
	11.147	11.010
	0.230E 03	0.184E 03
	10.153	13.100
	0.152E 03	0.247E 03
C--------		
	12.657	12.710
	0.241E 03	0.230E 03
	13.433	12.380
	0.300E 03	0.190E 03
	10.313	14.173
	0.154E 03	0.279E 03
C--------		
D----------		
	19.880	16.070
	0.468E 03	0.307E 03
	19.547	12.190
	0.818E 03	0.170E 03
	12.927	13.093
	0.241E 03	0.203E 03
C--------		
	14.197	16.130
	0.257E 03	0.298E 03
	12.803	14.887
	0.223E 03	0.239E 03
	11.087	16.007
	0.193E 03	0.435E 03
C--------		
D----------		

TABLE 20. ANALYSIS OF VARIANCE - MEAN MOVEMENT IN BLACK

	SS	DF	MS	F
BT S*S	36084.1641	359.		
A= INTEN	493.7773	2.	246.8887	2.557
C=MV-FRM	17.2656	1.	17.2656	0.179
D= CONST	1312.8398	1.	1312.8398	13.597
AC	120.5820	2.	60.2910	0.624
AD	197.1250	2.	98.5625	1.021
CD	228.0098	1.	228.0098	2.362
ACD	114.4648	2.	57.2324	0.593
S*S W	33600.1016	348.	96.5520	
W S*S	26820.5703	360.		
B= TIME	26.9375	1.	26.9375	0.376
AB	662.6855	2.	331.3428	4.627
BC	450.0918	1.	450.0918	6.285
BD	95.0449	1.	95.0449	1.327
ABC	28.9063	2.	14.4531	0.202
ABD	10.8398	2.	5.4199	0.076
BCD	545.8555	1.	545.8555	7.623
ABCD	79.6758	2.	39.8379	0.556
BXS*S	24920.5371	348.	71.6107	
TOTAL	62904.7344	719.		

TABLE 21. MEANS - MEAN FREEZING IN BLACK

	(1 - - - - -	- N)
	63.840	16.560
	0.489E 05	0.434E 03
	43.390	33.403
	0.593E 04	0.444E 04
	64.280	15.727
	0.255E 05	0.582E 03
C--------		
	36.483	43.327
	0.449E 04	0.139E 05
	55.667	20.663
	0.133E 05	0.875E 03
	40.657	18.157
	0.750E 04	0.833E 03
C--------		
D----------		
	13.503	13.290
	0.281E 03	0.213E 03
	18.060	14.203
	0.610E 03	0.347E 03
	30.220	25.453
	0.366E 04	0.176E 04
C--------		
	32.237	17.057
	0.251E 04	0.587E 03
	37.727	14.533
	0.346E 04	0.102E 04
	30.110	26.557
	0.370E 04	0.403E 04
C--------		
D----------		

TABLE 22. ANALYSIS OF VARIANCE - MEAN FREEZING IN BLACK

	SS	DF	MS	F
BT S*S	2030884.4531	359.		
A= INTEN	508.6250	2.	254.3125	0.045
C=MV-FRM	566.0156	1.	566.0156	0.100
D= CONST	40144.1953	1.	40144.1953	7.079
AC	4195.1406	2.	2097.5703	0.370
AD	6670.3672	2.	3335.1836	0.588
CD	5399.7500	1.	5399.7500	0.952
ACD	15.2734	2.	7.6367	0.001
S*S W	1973385.0938	348.	5670.6468	
W S*S	1779730.8438	360.		
B= TIME	53689.1641	1.	53689.1641	11.192
AB	1086.6172	2.	543.3086	0.113
BC	606.9531	1.	606.9531	0.127
BD	13968.1250	1.	13968.1250	2.912
ABC	15307.7734	2.	7653.8867	1.596
ABD	4348.6875	2.	2174.3438	0.453
BCD	9736.9531	1.	9736.9531	2.030
ABCD	10598.2344	2.	5299.1172	1.105
BXS*S	1669388.3438	348.	4797.0929	
TOTAL	3809615.2813	719.		

TABLE 23. MEANS - MEAN MOVEMENT IN WHITE

	(B1 - - - - -	- BN)
	13.780	18.850
	0.292E 03	0.434E 03
	12.573	14.477
	0.227E 03	0.305E 03
	12.783	12.420
	0.225E 03	0.207E 03
C--------		
	14.967	14.303
	0.341E 03	0.279E 03
	15.523	15.630
	0.295E 03	0.332E 03
	14.553	16.023
	0.254E 03	0.302E 03
C--------		
D----------		
	21.423	15.337
	0.706E 03	0.260E 03
	17.733	14.737
	0.565E 03	0.274E 03
	20.293	13.737
	0.805E 03	0.248E 03
C--------		
	16.390	18.643
	0.345E 03	0.414E 03
	14.883	15.257
	0.298E 03	0.290E 03
	16.340	11.193
	0.399E 03	0.165E 03
C--------		
D----------		

TABLE 24. ANALYSIS OF VARIANCE - MEAN MOVEMENT IN WHITE

	SS	DF	MS	F
BT S*S	46048.8672	359.		
A= INTEN	557.0176	2.	278.5088	2.197
C=MV-FRM	25.0469	1.	25.0469	0.198
D= CONST	504.6191	1.	504.6191	3.980
AC	88.5078	2.	44.2539	0.349
AD	60.6699	2.	30.3350	0.239
CD	346.9219	1.	346.9219	2.736
ACD	346.6484	2.	173.3242	1.367
S*S W	44119.4355	348.	126.7800	
W S*S	28997.1563	360.		
B= TIME	141.8652	1.	141.8652	1.849
AB	281.8633	2.	140.9316	1.837
BC	68.4434	1.	68.4434	0.892
BD	824.1016	1.	824.1016	10.739
ABC	5.7656	2.	2.8828	0.038
ABD	126.3809	2.	63.1904	0.823
BCD	443.0234	1.	443.0234	5.773
ABCD	400.4727	2.	200.2363	2.609
BXS*S	26705.2480	348.	76.7392	
TOTAL	75046.0234	719.		

TABLE 25. MEANS - MEAN FREEZING IN WHITE

```
        (B1 - - - - - BN)
          16.610     16.477
        0.442E 03 0.643E 03
          24.877     13.123
        0.149E 04 0.227E 03
          22.580     19.387
        0.135F 04 0.635F 03
    C---------
          22.527     29.073
        0.940F 04 0.564E 04
          20.757     17.893
        0.884E C3 0.115F 04
          20.077     14.557
        0.653F C3 0.374F 03
    C---------
  D------------

          12.280     12.337
        0.198E 03 0.171E 03
          14.150     12.957
        0.323F 03 0.232F 03
          23.697      5.810
        0.141F 04 0.141F 03
    C---------
          15.510     11.290
        0.372E C3 0.195E 03
          17.320     17.733
        0.534E C3 0.215E 03
          34.570     12.233
        0.405F 04 0.225F 03
    C---------
  D------------
```

TABLE 26. ANALYSIS OF VARIANCE - MEAN FREEZING IN WHITE

	SS	DF	MS	F
BT S*S	251201.3984	359.		
A= INTFN	1215.3223	2.	607.6611	0.881
C=WV-FRM	1144.9121	1.	1144.9121	1.660
D= CONST	3007.9590	1.	3007.9590	4.362
AC	643.2734	2.	321.6367	0.466
AD	2618.9824	2.	1309.4912	1.899
CD	53.8262	1.	53.8262	0.078
ACD	2561.9512	2.	1280.9756	1.858
S*S W	239955.1738	348.	689.5264	
W S*S	189885.0078	360.		
B= TIME	4974.9668	1.	4974.9668	9.867
AB	4176.5020	2.	2088.2510	4.142
BC	9.7715	1.	9.7715	0.019
BD	1068.8789	1.	1068.8789	2.120
ABC	560.6973	2.	280.3486	0.556
ABD	2481.4395	2.	1240.7197	2.461
BCD	1078.3223	1.	1078.3223	2.139
ABCD	78.2676	2.	39.1338	0.078
BXS*S	175456.1660	348.	504.1844	
TOTAL	441086.4063	719.		

TABLE 27. MEANS - TOTAL TIME IN BLACK

```
        (B1 - - - - - BN)
          642.913    492.170
        0.569F 06 0.384F 06
          494.913    446.667
        0.452F 06 0.374E 06
          507.253    446.503
        0.454F 06 0.341F 06
    C---------
          481.623    440.750
        0.424F 06 0.355E 06
          519.117    547.610
        0.403E 06 0.475E 06
          504.640    454.233
        0.463F 06 0.365F 06
    C---------
  D------------

          616.267    645.663
        0.485E 06 0.497E 06
          609.933    520.960
        0.480F 06 0.415F 06
          571.813    633.370
        0.453F 06 0.565F 06
    C---------
          562.853    552.913
        0.465F 06 0.422F 06
          565.157    426.037
        0.499F 06 0.320F 06
          492.350    630.587
        0.438F 06 0.517F 06
    C---------
  D------------
```

TABLE 28. ANALYSIS OF VARIANCE - TOTAL TIME IN BLACK

	SS	DF	MS	F
BT S*S	80867066.0000	359.		
A= INTFN	223088.0000	2.	111544.0000	0.491
C=WV-FRM	188708.0000	1.	188708.0000	0.831
D= CONST	824910.0000	1.	824910.0000	3.633
AC	254406.0000	2.	127203.0000	0.560
AD	101006.0000	2.	50503.0000	0.222
CD	61646.0000	1.	61646.0000	0.272
ACD	203482.0000	2.	101741.0000	0.448
S*S W	79009670.0000	348.	227039.7109	
W S*S	35531160.0000	360.		
B= TIME	152584.0000	1.	152584.0000	1.555
[illegible]	293940.0000	2.	146970.0000	1.498
BC	5024.0000	1.	5024.0000	0.051
BD	109176.0000	1.	109176.0000	1.113
ABC	5048.0000	2.	2524.0000	0.026
ABD	629590.0000	2.	314795.0000	3.208
BCD	134306.0000	1.	134306.0000	1.369
ABCD	51806.0000	2.	25903.0000	0.264
BXS*S	34149696.0000	348.	98131.2813	
TOTAL	116398226.0000	719.		

TABLE 29. MEANS - TOTAL TIME IN WHITE

```
        (B1 - - - - - BN)
          557.087    707.410
        0.466F 06 0.643F 06
          705.087    754.313
        0.704F 06 0.741F 06
          692.747    725.240
        0.677F 06 0.709E 06
    C---------
          718.377    759.250
        0.708F 06 0.737F 06
          680.883    652.190
        0.547F 06 0.601F 06
          695.360    745.767
        0.692F 06 0.715E 06
    C---------
  D------------

          583.733    554.337
        0.446F 06 0.348F 06
          590.087    675.040
        0.457E 06 0.605F 06
          678.187    566.630
        0.640E 06 0.455F 06
    C---------
          617.147    647.087
        0.506F 06 0.535F 06
          614.843    771.363
        0.535E 06 0.731E 06
          707.650    545.413
        0.697E 06 0.536E 06
    C---------
  D------------
```

TABLE 30. ANALYSIS OF VARIANCE - TOTAL TIME IN WHITE

	SS	DF	MS	F
BT S*S	80464680.0000	359.		
A= INTFN	205180.0000	2.	102590.0000	0.454
C=WV-FRM	217384.0000	1.	217384.0000	0.961
D= CONST	768964.0000	1.	768964.0000	3.401
AC	240800.0000	2.	120400.0000	0.532
AD	88964.0000	2.	44482.0000	0.197
CD	46584.0000	1.	46584.0000	0.206
ACD	207280.0000	2.	103640.0000	0.458
S*S W	78689524.0000	348.	226119.3203	
W S*S	35857400.0000	360.		
B= TIME	129308.0000	1.	129308.0000	1.304
AB	343184.0000	2.	171592.0000	1.730
BC	988.0000	1.	988.0000	0.010
BD	88968.0000	1.	88968.0000	0.897
ABC	10584.0000	2.	5292.0000	0.053
ABD	582788.0000	2.	291394.0000	2.937
BCD	112560.0000	1.	112560.0000	1.135
ABCD	73632.0000	2.	36816.0000	0.371
BXS*S	34515604.0000	348.	99182.1953	
TOTAL	116322080.0000	719.		

TABLE 31. MEANS - CROSSES TO BLACK

(B1 ------	B4)
5.800	6.900
0.525E 02	0.827E 02
3.833	4.333
0.326E 02	0.440E 02
3.267	5.033
0.290E 02	0.474E 02
C---------	
3.567	5.067
0.240E 02	0.501E 02
7.067	6.233
0.867E 02	0.746E 02
4.867	5.567
0.409E 02	0.547E 02
C---------	
D-----------	
10.667	10.133
0.152E 03	0.126E 03
11.333	9.933
0.206E 03	0.136E 03
6.600	7.833
0.106E 03	0.117E 03
C---------	
10.467	11.567
0.155E 03	0.184E 03
6.033	7.733
0.686E 02	0.872E 02
6.100	7.633
0.812E 02	0.117E 03
C---------	
D-----------	

TABLE 32. ANALYSIS OF VARIANCE - CROSSES TO BLACK

	SS	DF	MS	F
BT S*S	23316.2656	359.		
A= INTEN	561.3447	2.	280.6724	5.086
C=MV-FRM	17.7349	1.	17.7349	0.321
D= CONST	2475.3125	1.	2475.3125	44.854
AC	41.0776	2.	20.5388	0.372
AD	282.0332	2.	141.0166	2.555
CD	129.2012	1.	129.2012	2.341
ACD	604.7446	2.	302.3723	5.479
S*S W	19204.8169	348.	55.1863	
W S*S	6218.5000	360.		
B= TIME	87.5015	1.	87.5015	5.122
AB	52.8110	2.	26.4055	1.546
BC	11.5015	1.	11.5015	0.673
BD	1.5127	1.	1.5127	0.089
ABC	17.9111	2.	8.9556	0.524
ABD	15.8335	2.	7.9167	0.463
BCD	61.8350	1.	61.8350	3.620
ABCD	24.5781	2.	12.2891	0.719
BXS*S	5945.0166	348.	17.0834	
TOTAL	29534.7656	719.		

TABLE 33. MEANS - CROSSES TO WHITE

(B1 ------	B4)
6.333	7.367
0.597E 02	0.880E 02
4.500	4.967
0.380E 02	0.501E 02
4.033	5.733
0.347E 02	0.551E 02
C---------	
4.233	5.733
0.304E 02	0.585E 02
7.633	6.800
0.934E 02	0.615E 02
5.433	6.167
0.462E 02	0.610E 02
C---------	
D-----------	
11.100	10.533
0.161E 03	0.135E 03
11.967	10.500
0.221E 03	0.148E 03
7.233	8.333
0.113E 03	0.126E 03
C---------	
10.900	12.133
0.163E 03	0.197E 03
6.633	8.400
0.773E 02	0.988E 02
6.733	8.200
0.873E 02	0.125E 03
C---------	
D-----------	

TABLE 34. ANALYSIS OF VARIANCE - CROSSES TO WHITE

	SS	DF	MS	F
BT S*S	23136.8003	359.		
A= INTEN	512.6333	2.	256.3167	4.642
C=MV-FRM	16.2002	1.	16.2002	0.293
D= CONST	2390.7554	1.	2390.7554	43.294
AC	32.4331	2.	16.2166	0.294
AD	269.4119	2.	134.7058	2.439
CD	118.4224	1.	118.4224	2.144
ACD	579.8105	2.	289.9053	5.250
S*S W	19217.1338	348.	55.2216	
W S*S	6106.0000	360.		
B= TIME	82.6890	1.	82.6890	4.932
AB	49.4780	2.	24.7390	1.476
BC	16.1997	1.	16.1997	0.966
BD	1.4224	1.	1.4224	0.085
ABC	18.4336	2.	9.2168	0.550
ABD	13.3774	2.	6.6887	0.399
BCD	64.7998	1.	64.7998	3.865
ABCD	25.6006	2.	12.8003	0.764
BXS*S	5834.0000	348.	16.7644	
TOTAL	29242.8003	719.		

TABLE 35. MEANS - TOTAL CROSSES

(B1 ------	B4)
12.133	14.267
0.224E 03	0.341E 03
8.333	9.300
0.141E 03	0.188E 03
7.300	10.767
0.127E 03	0.204E 03
C---------	
7.800	10.800
0.108E 03	0.217E 03
14.700	13.033
0.359E 03	0.312E 03
10.300	11.733
0.174E 03	0.231E 03
C---------	
D-----------	
21.767	20.667
0.625E 03	0.522E 03
23.300	20.433
0.854E 03	0.568E 03
13.833	16.167
0.438E 03	0.485E 03
C---------	
21.367	23.700
0.634E 03	0.762E 03
12.667	16.133
0.291E 03	0.371E 03
12.833	15.833
0.337E 03	0.482E 03
C---------	
D-----------	

TABLE 36. ANALYSIS OF VARIANCE - TOTAL CROSSES

	SS	DF	MS	F
BT S*S	92792.7988	359.		
A= INTEN	2146.4766	2.	1073.2383	4.867
C=MV-FRM	67.8340	1.	67.8340	0.308
D= CONST	9731.4004	1.	9731.4004	44.133
AC	145.8789	2.	72.9395	0.331
AD	1102.3457	2.	551.1729	2.500
CD	495.0137	1.	495.0137	2.245
ACD	2368.5313	2.	1184.2656	5.371
S*S W	76735.3184	348.	220.5038	
W S*S	24575.5000	360.		
B= TIME	340.3125	1.	340.3125	5.043
AB	204.4336	2.	102.2168	1.515
BC	55.0020	1.	55.0020	0.815
BD	5.8691	1.	5.8691	0.087
ABC	72.6777	2.	36.3389	0.538
ABD	58.2129	2.	29.1064	0.431
BCD	253.2344	1.	253.2344	3.752
ABCD	100.3125	2.	50.1563	0.743
BXS*S	23485.4492	348.	67.4869	
TOTAL	117368.2988	719.		

TABLE 37. MEANS - PERCENTAGE-FREEZING IN BLACK

(B1 - - - - - BN)	
46.997	34.333
0.303E 04	0.182E 04
47.570	36.927
0.341E 04	0.233E 04
44.710	28.847
0.322E 04	0.152E 04
C---------	
41.293	36.760
0.270E 04	0.233E 04
43.133	39.703
0.291E 04	0.234E 04
40.923	31.747
0.272E 04	0.184E 04
C---------	
D------------	
25.643	31.053
0.108E 04	0.133E 04
27.637	28.873
0.119E 04	0.138E 04
33.460	40.020
0.220E 04	0.235E 04
C---------	
41.883	24.530
0.246E 04	0.976E 03
48.337	21.540
0.368E 04	0.892E 03
36.577	34.643
0.223E 04	0.187E 04
C---------	
D------------	

TABLE 38. ANALYSIS OF VARIANCE - PERCENTAGE-FREEZING IN BLACK

	SS	DF	MS	F
BT S*S	372966.5156	359.		
A= INTEN	258.6953	2.	129.3477	0.125
C=MV-FRM	283.7344	1.	283.7344	0.275
D= CONST	7753.7656	1.	7753.7656	7.510
AC	422.8359	2.	211.4180	0.205
AD	3476.4141	2.	1738.2070	1.684
CD	885.0938	1.	885.0938	0.857
ACD	601.8203	2.	300.9102	0.291
S*S W	359284.1563	348.	1032.4257	
W S*S	223707.0469	360.		
B= TIME	9945.3047	1.	9945.3047	17.512
AB	692.1094	2.	346.0547	0.609
BC	1732.9219	1.	1732.9219	3.051
BD	683.9453	1.	683.9453	1.204
ABC	707.8438	2.	353.9219	0.623
ABD	3214.7500	2.	1607.3750	2.830
BCD	8268.6016	1.	8268.6016	14.560
ABCD	833.2422	2.	416.6211	0.734
BXS*S	197628.3359	348.	567.8975	
TOTAL	596673.5625	719.		

TABLE 39. MEANS - PERCENTAGE-FREEZING IN WHITE

(B1 - - - - - BN)	
34.453	32.813
0.181E 04	0.149E 04
45.653	34.103
0.281E 04	0.207E 04
43.823	44.347
0.277E 04	0.277E 04
C---------	
40.670	38.593
0.246E 04	0.214E 04
39.683	31.947
0.222E 04	0.170E 04
40.837	34.140
0.238E 04	0.156E 04
C---------	
D------------	
22.893	30.130
0.876E 03	0.115E 04
25.670	29.840
0.106E 04	0.127E 04
32.230	25.203
0.164E 04	0.986E 03
C---------	
29.350	21.393
0.133E 04	0.663E 03
34.273	32.453
0.172E 04	0.141E 04
39.823	33.053
0.228E 04	0.164E 04
C---------	
D------------	

TABLE 40. ANALYSIS OF VARIANCE - PERCENTAGE-FREEZING IN WHITE

	SS	DF	MS	F
BT S*S	274430.5859	359.		
A= INTEN	3610.4844	2.	1805.2422	2.522
C=MV-FRM	128.3359	1.	128.3359	0.179
D= CONST	15055.7422	1.	15055.7422	21.033
AC	257.6641	2.	128.8320	0.180
AD	215.4609	2.	107.7305	0.151
CD	1871.2656	1.	1871.2656	2.614
ACD	4189.4531	2.	2094.7266	2.926
S*S W	249102.1875	348.	715.8109	
W S*S	145710.1250	360.		
B= TIME	1654.1094	1.	1654.1094	4.114
AB	449.8828	2.	224.9414	0.559
BC	1106.4297	1.	1106.4297	2.752
BD	178.4688	1.	178.4688	0.444
ABC	185.8047	2.	92.9023	0.231
ABD	1111.2734	2.	555.6367	1.382
BCD	184.3281	1.	184.3281	0.458
ABCD	927.2969	2.	463.6484	1.153
BXS*S	139912.5313	348.	402.0475	
TOTAL	420140.7109	719.		

REFERENCES

Allison, J., Larson, D., and Jensen, D. D. Acquired fear, brightness preference, and one-way shuttle box performance. *Psychonomic Science*, 1967, 8, 269-270.

Barnett, A. The phase angle of normal human skin. *Journal of Physiology*, 1938, 93, 349-366.

Billingslea, F. Y. Intercorrelational analysis of certain behavior salients in the rat. *Journal of Comparative Psychology*, 1942, 34, 203-211.

Bindra, D. *Motivation a systematic reinterpretation*. New York: Ronald Press, 1959.

Bindra, D., and Anchel, H. Immobility as an avoidance response, and its disruption by drugs. *Journal of the Experimental Analysis of Behavior*, 1963, 6, 213-218.

Bindra, D., and Palfai, T. Nature of positive and negative incentive-motivational effects on general activity. *Journal of Comparative and Physiological Psychology*, 1967, 63, 288-297.

Bolles, R. C. Shock density and effective shock intensity: a comparison of different shock scramblers. *Journal of the Experimental Analysis of Behavior*, 1966, 9, 553-556.

Braun, H. W., Russell, R. W., and Patton, R. A. Duration of decrements in learning and retention following electroshock convulsions in the white rat. *Journal of Comparative and Physiological Psychology*, 1949, 42, 87-106.

Brogden, W. J., Lipman, E. A., and Culler, E. The role of incentive in conditioning and extinction. *American Journal of Psychology*, 1938, 51, 109-117.

Brookshire, K. H., Littman, R. A., and Stewart, C. N. Residua of shock-trauma in the white rat. *Psychological Monographs*, 1961, 75, whole No. 514.

Brown, J. S., and Farber, I. E. Emotions conceptualized as intervening variables - with suggestions toward a theory of frustration. *Psychological Bulletin*, 1951, 48, 465-495.

Brown, J. S., and Jacobs, A. The role of fear in the motivation and acquisition of responses. *Journal of Experimental Psychology*, 1949, 39, 747-759.

Brown, J. S., Kalish, H. I., and Farber, I. E. Conditioned fear as revealed by magnitude of startle response to an auditory stimulus. *Journal of Experimental Psychology*, 1951, 41, 317-328.

Campbell, B. A. The reinforcement difference limen (RDL) function for shock reduction. *Journal of Experimental Psychology*, 1956, 52, 258-262.

Campbell, B. A. Development studies of learning and motivation in infraprimate mammals, in *Early behavior: comparative and developmental approaches*, Stevenson, H. W., Hess, E. H., and Rheingold, H. L. (Eds.). New York: John Wiley and Sons, Inc., 1967.

Campbell, B. A., and Campbell, E. H. Retention and extinction of learned fear in infant and adult rats. *Journal of Comparative and Physiological Psychology*, 1962, 55, 1-8.

Campbell, B. A., and Kraeling, D. Response strength as a function of drive level and amount of drive reduction. *Journal of Experimental Psychology*, 1953, 45, 97-101.

Campbell, B. A., and Teghtsoonian, R. Electrical and behavioral effects of different types of shock on the rat. *Journal of Comparative and Physiological Psychology*, 1958, 51, 185-192.

Campbell, B. A., and Teghtsoonian, R. Electrical and behavioral effects of different types of shock on the rat. Mimeographed report, 1958.

Castaneda, A., and Worrell, L. Differential relation of latency and response vigor to stimulus similarity in brightness discrimination. *Journal of Experimental Psychology*, 1961, 61, 309-314.

Colman, F. D. Response to different types of electric shock stimuli in the rat. Unpublished M. A. thesis, University of Western Ontario, London, Canada, 1966.

Cornsweet, T. N. *The design of electric circuits in the behavioral sciences*. New York: Wiley and Sons, 1963.

Curti, M. W. Native fear responses of white rats in the presence of cats. *Psychological Review Monograph*, 1936, 46, 78-98.

Curti, M. W. A further report on fear responses of white rats in the presence of cats. *Journal of Comparative Psychology*, 1942, 34, 51-53.

Denenberg, V. H. Effects of avoidable and unavoidable electric shock upon mortality in the rat. *Psychological Reports*, 1964, 14, 43-46.

Donaldson, H. H. *The rat: data and reference tables*, 2nd ed. Philadelphia: Wistar Institute of Anatomy, 1924.

Douglas, R. J. Cues for spontanteous alternation. *Journal of Comparative and Physiological Psychology*, 1966, 62, 171-183.

England, S. J. M. A constant power shock source and electronic grid scrambler with an historical introduction. *Journal of Perceptual and Motor Skills*, 1964, 18, 961-975.

Eriksen, C. W., Porter, P. B., and Stone, C. P. Learning ability in rats given electroconvulsive shocks in late infancy. *Journal of Comparative and Physiological Psychology*, 1948, 41, 144-154.

Feirstein, A. R., and Miller, N. E. Learning to resist pain and fear: effects of electric shock before versus after reaching goal. *Journal of Comparative and Physiological Psychology*, 1963, 56, 797-800.

Finger, F. W. Quantatative studies of "conflict": I. Variations in latency and strength of the rat's response in a discrimination-jumping situation. *Journal of Comparative Psychology*, 1941, 31, 97-127.

Finger, F. W. Convulsive behavior in the rat. *Psycholigical Bulletin*, 1947, 44, 201-248.

Forbes, T. W., and Bernstein, A. L. The standardization of sixty-cycle electric shock for practival use in psychological experimentation. *Journal of General Psychology*, 1935, 12, 436-442.

Forbes, T. W., Muenzinger, K. F., and Wendt, G. R. Report of round tables on use of electric shock. *Psychological Bulletin*, 1935, 32, 185-196.

Fowler, H. Facilitation ind inhibition of performance by punishment: the effects of shock intensity and distribution of trials. *Journal of Comparative and Physiological Psychology*, 1963, 56, 531-538.

Freedman, P. E. Habituation of alternation behavior. *Journal of Experimental Psychology*, 1965, 69, 613-617.

Geddes, L. A., and Baker, L. E. Factors affecting the current and voltage waveforms and current distribution in electro-anesthesia. *Third national symposium on electro-anesthesia*, Saint Louis University, School of Medicine, Department of Physiology, 1966, 2.

Gilmer, B. H. The sensitivity of the fingers to alternating electrical currents. *American Journal of Psychology*, 1937, 49, 444-449.

Grings, W. W. Methodological considerations underlying electrodermal measurement. *Journal of Psychology,* 1953, 35, 271-282.

Gwinn, G. T. Resistance to extinction of learned-fear drives. *Journal of Experimental Psychology,* 1951, 42, 6-12.

Hawkins, J. T. The effect of number of shock presentations on 'freezing' behavior. Unpublished M. A. thesis, University of Western Ontario, London, Canada, 1964.

Hawkins, J. T., and McClelland, W. J. *Electronic recording of shuttle box activity,* paper read at annual meeting of Canadian Psychological Association, Ottawa, May, 1967.

Hayes, K. J. Cognitive and emotional effects of electro-convulsive shock in rats. *Journal of Comparative and Physiological Psychology,* 1948, 41, 40-61.

Helmholtz. *Poggendorf's Annalen der physik und chemie,* 1851, 83, 505, (cited in Martin, 1908).

Hill, H. E., Flanary, H. G., Kornetsky, C. H., and Wikler, A. Relationship of electrically induced pain to amperage and wattage of shock stimulus. *Journal of Clinical Investigation,* 1952, 31, 464-472.

Hittinger, W. C., and Sparks, M. Microelectronics. *Scientific American,* 1965, 213, 56-70.

Hoffman, H. S., and Fleshler, M. A device for the assessment of startle. *American Journal of Psychology,* 1964, 77, 307-308.

Hoffman, H. S., Fleshler, M., amd Abplanalp, P. L. Startle reaction to electrical shock in the rat. *Journal of Comparative and Physiological Psychology,* 1964, 58, 132-139.

Howard, T. C. Conditioned temperature drive in rats. *Psychological Reports,* 1962, 10, 371-373.

Hutchinson, R. R., Ulrich, R. E., and Azrin, N. H. Effects of age and related factors on the pain-aggression reaction. *Journal of Comparative and Physiological Psychology,* 1965, 59, 365-369.

Hyatt, R. E. The persistence of a conditioned fear response in rats as a function of age when conditioned and duration of exposure to shock. Unpublished M. A. thesis, University of Western Ontario, London, Canada, 1964.

Jackson, T. A., and Riess, B. F. Electric shock with different size electrodes. *Journal of Genetic Psychology,* 1934, 45, 262-266.

Jenkins, T. N., Warner, L. H., and Warden, C. J. Standard apparatus for the study of animal motivation. *Journal of Comparative Psychology*, 1926, 6, 361-382.

Kalish, H. I. Strength of fear as a function of the number of acquisition and extinction trials. *Journal of Experimental Psychology*, 1954, 47, 1-9.

Kellogg, W. N. Electric shock as a motivating stimulus in conditioning experiments. *Journal of General Psychology*, 1941, 25, 85-96.

Kirby, R. H. Acquisition, extinction, and retention of an avoidance response in rats as a function of age. *Journal of Comparative and Physiological Psychology*, 1963, 56, 158-162.

Ko, W. H., and Neuman, M. R. Implant biotelemetry and microelectronics. *Science*, 1967, 156, 351-360.

Krieckhaus, E. E., and Chi, C. C. Role of freezing and fear in avoidance decrements following mammillothalamic tractotomy in cat: 1. Two-way avoidance behavior. *Psychonomic Science*, 1966, 4, 263-264.

Lashley, K. S. The mechanism of vision. XV- Preliminary studies of the rat's capacity for detail vision. *The Journal of General Psychology*, 1938, 18, 123-193.

Licklider, J. C. A gridless, wireless rat shocker. *Journal of Comparative and Physiological Psychology*, 1951, 44, 334-337.

Light, R. U., and Chaffee, E. L. Electrical excitation of the nervous system. *Science*, 1934, 79, 299-300.

Littman, R. A., Stevens, D. A., and Whittier, J. L. Previous shock experience and response thresholds to shock. *Canadian Journal of Psychology*, 1964, 18, 93-100.

Lorge, I. Physiological aspects of lethal shock. *Psychological Bulletin*, 1935, 32, 197-202.

Maier, N. R. F. Studies of abnormal behavior in the rat: the neurotic pattern and an analysis of the situation which produces it.

Maier, N. R. F. *Studies of abnormal behavior in the rat: the neurotic pattern and an analysis of the situation which produces it.* New York: Harper, 1939.

Maier, N. R. F., and Feldman, R. S. Studies of abnormal behavior in the rat: Water spray as a means of inducing seizures. *Journal of Comparative Psychology*, 1946, 39, 275-286.

Martin, E. G. A quantatative study of faradic stimulation. II The calibration of the inductorium for break shocks. *American Journal of Physiology*, 1908, 22, 116-132.

McClelland, W. J. An electronic apparatus for recording movements in small animals. *Journal of the Experimental Analysis of Behavior*, 1965, 8, 215-218.

McClelland, W. J. *Parameters of "freezing" in rats*, paper read at annual meeting of Canadian Psychological Association, Montreal, June, 1966.

McClelland, W. J., and Colman, F. D. Activity and different types of electric shock. *Psychonomic Science*, 1967, 7, 391-392.

Miller, N. E. Studies of fear as an acquirable drive: I. Fear as motivation and fear-reduction as reinforcement in learning new responses. *Journal of Experimental Psychology*, 1948, 38, 99-101.

Miller, N. E. Learnable drives and rewards, in Stevens, S. S. (Ed.), *Handbook of Experimental Psychology*, New York: Wiley, 1951, 435-472.

Miller, N. E. Liberalization of basic S-R concepts: extensions to conflict behavior, motivation and social learning. In Koch, S. (Ed.), *Psychology: a study of a science*, V. 2, New York: McGraw-Hill, 1959, 196-292.

Miller, N. E., and Murray, E. J. Displacement and conflict: learnable drive as a basis for the steeper gradient of avoidance than of approach. *Journal of Experimental Psychology*, 1952, 43, 227-231.

Mowrer, O. H. A stimulus-response analysis of anxiety and its role as a reinforcing agent. *Psychological Review*, 1939, 45, 62-91.

Mowrer, O. H. On the dual nature of learning - a reinterpretation of "conditioning" and "problem-solving". *Harvard Educational Review*, 1947, 17, 102-148.

Muenzinger, K. F., and Mize, R. H. The sensitivity of the white rat to electric shock: threshold and skin resistance. *Journal of Comparative Psychology*, 1933, 15, 139-148.

Muenzinger, K. F., and Walz, F. C. An analysis of the electrical stimulus producing a shock. *Journal of Comparative Psychology*, 1932, 13, 157-171.

Muenzinger, K. F., and Walz, F. C. An examination of electrical-current-stabilizing devices for psychological experiments. *Journal of General Psychology*, 1934, 10, 477-482.

Munn, N. L. *Handbook of psychological research on the rat*. Boston: Houghton Mifflin Company, 1950.

Passey, G. E. The influence of intensity of unconditioned stimulus upon acquisition of a conditioned response. *Journal of Experimental Psychology*, 1948, 38, 420-428.

Plutchik, R., and Hirsch, H. R. Skin impedance and phase angle as a function of frequency and current. *Science*, 1963, 141, 927-928.

Robinson, E. Effect of amygdalectomy of fear-motivated behavior in rats. *Journal of Comparative and Physiological Psychology*, 1963, 56, 814-820.

Rohles, F. H. Jr. Wind as an aversive stimulus. *Journal of the Experimental Analysis of Behavior*, 1965, 8, 203-205.

Sheffield, F. D., and Temmer, H. W. Relative resistance to extinction of escape training and avoidance training. *Journal of Experimental Psychology*, 1950, 40, 287-297.

Silver, M. P., Schoenfeld, W. N., Snapper, A. G., and Locke, B. Impedance-voltage functions in the white rat with chronic body electrode implants. *Psychonomic Science*, 1964, 1, 61-62.

Solomon, R. L., and Brush, E. S. Experimentally derived conceptions of anxiety and aversion. In Jones, M. R. (Ed.) *Nebraska symposium on motivation: 1956*, Lincoln, Nebraska: University of Nebraska Press, 1956.

Spencer, E. W., Ingram, V. M., and Levinthal, C. Electrophoresis: an accident and some precautions. *Science*, 1966, 152, 1722-1723.

Stavely, H. E. Jr. Effect of escape duration and shock intensity on the acquisition and extinction of an escape response. *Journal of Experimental Psychology*, 1966, 72, 698-703.

Townsend, J. C., Russell, R. W., and Patton, R. A. Effects of Electroshock convulsions on retention in rats as functions of intensity of electroshock stimulus. *Journal of Comparative and Physiological Psychology*, 1949, 42, 148-155.

Watson, J. B., and Raynor, R. Conditioned emotional reactions. *Journal of Experimental Psychology*, 1920, 3, 1-14.

Weber, H. F. (cited in Lorge, 1935)

Worrell, L., and Castaneda, A. Individual differences in conflict resolution and the ease of learning. *American Psychologist*, 1961, 16, 400. (Abstract).

Young, P. T. *Motivation and emotion a survey of the determinants of human and animal activity*. New York: Wiley and Son, 1961.